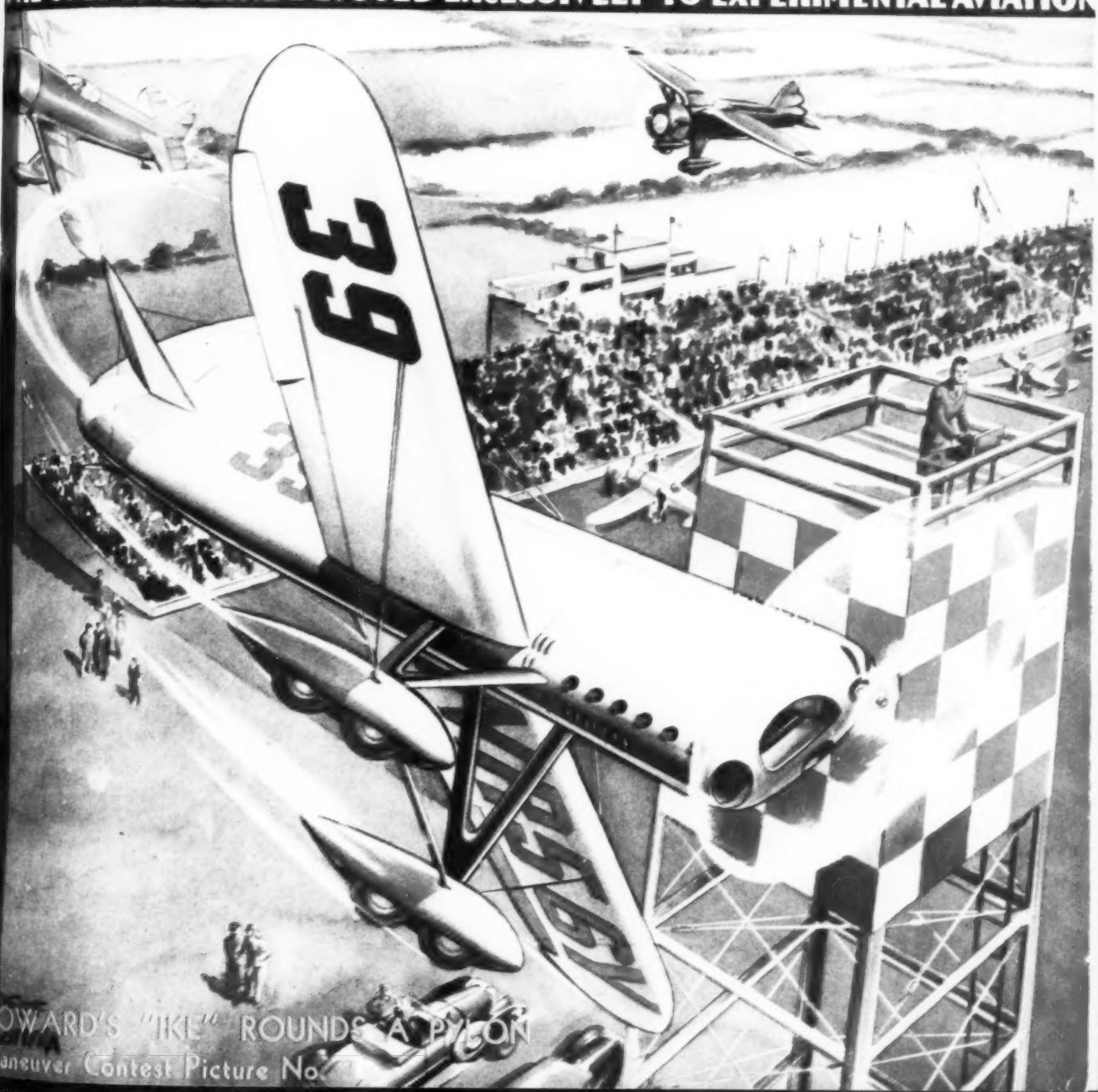
UNIVERSAL

MODEL AIRPLANE NEWS

APRIL 1933

15¢

THE ONLY MAGAZINE DEVOTED EXCLUSIVELY TO EXPERIMENTAL AVIATION



OWARD'S "IKE" ROUNDS A PYLON

aneuver Contest Picture No.

NEW LOW PRICES!

12-Inch Midget Twin Pusher Kit — 25¢

All necessary materials, plans and instructions POSTPAID

Beginners and experienced model builders will welcome these scale models because of their many wonderful features.

CONSOLIDATED COMMODORE

Solid Scale Model—14" wing span

Complete Kit **$1.50 postpaid**

Flying Boat

CURTISS-WRIGHT Junior

Solid Scale Model—16" wing span

Complete Kit **$1.25 postpaid**

FORD TRI-MOTOR TRANSPORT PLANE

Solid Scale Model—14" wing span

Complete Kit **$2.00 postpaid**

COL. LINDBERGH'S LOCKHEED SIRIUS

Solid Scale Model *16" wing span*

Complete Kit **$1.70 postpaid**

MONEY-BACK GUARANTEE ON ALL MERCHANDISE

JAPANESE "SILK" TISSUE
White 20x24
Per sheet ..... .02
10 for ..... .19
Colored
2 for ..... .05
10 for ..... .22

SUPERFINE TISSUE
Per sheet ..... .07
10 for ..... .61

WOOD VENEER
20x30
Per sheet ..... .17
10 sheets 1.62

SHEET CELLULOID
7"x10"
Per sheet ..... .09
10 sheets ..... .81

CELLULOID WHEELS
¾" dia. ..... pr. .08
1" dia. ..... pr. .08
1⅜" dia. ..... pr. .12
1⅞" dia. ..... pr. .21

DUMMY RADIAL ENGINES
1½" ..... ea. .25
2" ..... ea. .10
3" ..... ea. .51

WASHERS
⅛" O.D. or ¼" O.D.
Per dozen ..... .02
Per gross ..... .15

DOUGHNUT RUBBER AIR WHEELS
1" ..... pr. .07
1½" ..... pr. .11
1⅞" ..... pr. .13

RUBBER TIRED DISC WHEELS
¾ dia. ..... ea. .04
½ dia. ..... ea. .04
⅝ dia. ..... ea. .05
⅞ dia. ..... ea. .07

CELLULOID PANTS
For ¾" or 1" wheels
Pair ..... .25
For 1⅜" or 1⅞" wheels
Pair ..... .45

ALUMINUM LEAF
.0003 of an inch in thickness, 3½" wide
10 feet for ..... .05

BALSA WOOD

The lightest and strongest known—kiln-dried and free from defects.

(If 36" lengths are desired, just double 18" price.)

18" BALSA WOOD
1/16x1/16 ..50 for .05
1/16x3/32 ..50 for .05
1/16x1/8 ...50 for .05
1/16x3/16 ..25 for .05
1/16x1/4 ...17 for .05
3/32x3/32 ..50 for .05
1/8 x1/8 ...27 for .05
1/8 x3/16 ..22 for .05
1/8 x1/4 ...20 for .05
1/8 x3/8 ... 7 for .05
3/16x3/16 ..15 for .05
3/16x1/4 ...15 for .05
3/16x3/8 ... 8 for .05
1/4 x1/4 ...10 for .05
1/4 x1/2 ... 5 for .05
1/2 x1/2 ... 3 for .05

BALSA PROPELLER BLOCKS
½x ¾x 5" 5 for .04
½x ¾x 6" 4 for .05
5x1 x 7" 2 for .05
5x1 x 8" 1 for .03
¾x1¼x10" 1 for .04
¾x1¼x12" 1 for .04
1 x1½x15" 1 for .11

COLORLESS CEMENT
½ oz. ..... .05
2 oz. ..... .11
4 oz. ..... .19
1 pint ..... .65
1 quart 1.10

CAMEL'S HAIR BRUSHES
2 for ..... .05

THINNER
½ oz. ..... .05
2 oz. ..... .10
4 oz. ..... .16
1 pint ..... .56
1 quart ..... .98

DUMMY MACHINE GUNS
Pursuit Type
Each ..... .10

FLANGED BUSHINGS
1/16 dia. x 5/32
10 for ..... .05
1/16 dia. x 7/32
10 for ..... .05
3/32 dia. x 1/4
10 for ..... .05
1/8 dia. x 1/2
10 for ..... .07
1/4 dia. x 3/16
10 for ..... .05

18" BALSA SHEETS
1/32x2" ..... 2 for .03
1/16x2" ..... 4 for .07
3/32x2" ..... 4 for .07
1/8 x2" ..... 2 for .04
3/16x2" ..... 2 for .05
1/4 x2" ..... 2 for .06
1/2 x2" ..... 2 for .10
1/32x3" ..... 2 for .10
1/16x3" ..... 2 for .10
3/32x3" ..... 2 for .10
1/8 x3" ..... 2 for .10
3/16x3" ..... 2 for .10
1/4 x3" ..... 2 for .10
1/2 x3" ..... 2 for .18

18" BALSA PLANKS
1 x1 x18" 2 for .10
1 x2 x18" 2 for .17
1 x3 x18" 2 for .25
1 x6 x18" 1 for .25
1½x1½x18" 2 for .25
2 x2 x18" 1 for .17
2 x3 x18" 1 for .25
2 x6 x18" 1 for .49
3 x3 x18" 1 for .37
3 x6 x18" 1 for .74

BAMBOO
1/16 sq. x 10½"
100 for ..... .05
1/16 x ⅝ x 15"
2 for ..... .03

COLORED DOPE
½ oz. ..... .05
2 oz. ..... .12
4 oz. ..... .20
1 pint ..... .70
1 quart 1.20

CLEAR DOPE
½ oz. ..... .05
2 oz. ..... .10
4 oz. ..... .16
1 pint ..... .56
1 quart ..... .98

REED
1/16" dia. 5 ft. .02
3/32" dia. 4 ft. .03
1/8" dia. 3 ft. .03

SHEET ALUMINUM
Per sq. ft. ..... .30

ALUMINUM TUBING
3/32 O.D. ... ft. .17
1/8 O.D. ... ft. .13
3/16 O.D. ... ft. .17
1/4 O.D. ... ft. .20

N.A.C.A. CELLULOID COWLINGS
2½" ..... .26
2¾" ..... .33

FINEST PARA RUBBER
App. 3/32" to 1/8" flat
Per 225 ft. skein .28

MUSIC WIRE STRAIGHT
Cut to one-foot lengths
.014, .020, .028, .034
Per foot ..... .01

THRUST BEARINGS
10 for ..... .10

MODEL PINS
Per package .... .05

SANDPAPER
Per package .... .05

INSIGNIA
(24 different)
Per sheet ..... .07
10 sheets ..... .65

ALUMINUM COWLINGS

	Open	Closed	Drag
1"	.20	.21	.20
1½"	.21	.21	.22
2"	.30	.30	.30
2½"	.32	.32	.33
3"	.41	.44	.41

PROPELLERS DIE CAST
Standard Steel Type
2 bladed
2" dia. ..... ea. .10
3" dia. ..... ea. .10
3 bladed
1½" dia. ..... ea. .10

DIE CAST MOTORS
3 cyl. light plane type
1½" dia. ..... .10
9 cyl. whirlwind type
1" dia. ..... .10

HARDWOOD MOTOR NACELLES
¾" dia., 1½" long
Each ..... .07

DOWELS
1/16 dia. x 6"
Dozen ..... .07
1/16 dia. x 12"
Dozen ..... .14
1/8 dia. x 18"
5 for ..... .05

24-HOUR SERVICE!

Model Manufacturers! Dealers! Clubs!

Send for your

FREE SAMPLE

and quotations on this attractively tubed

Clear Cement

Packed in gross cartons. State quantities you will most likely be interested in. (Make request on your business letterhead.)

Size of tube exactly as illustrated.

UNIVERSAL MODEL AIRPLANES, INC.
4016 Church Ave., Brooklyn, N. Y.

WANTED! 25,000 DEALERS!

On NET (*) Orders of $5 to $10, Deduct 25% Discount!
On NET (*) Orders of $10 or over, Deduct 40% Discount!

(*) This means that your order must amount to at least $5 or $10 AFTER DISCOUNT HAS BEEN DEDUCTED. (These amounts are exclusive of postage charges.) For instance:—On an order of $16.66 for merchandise at above retail prices, deduct 40% discount, leaving net amount exactly $10.00. Then add 15% for postage, $2.49, and the total amount to cover the order will be $12.49.

No orders under $1.00 will be accepted. Add 25c for packing and postage to all orders under $1.65. On all orders over $1.65, add 15% of order. Canadian, add 20%.

DEALERS: Figure postage charges on above retail prices. ONLY MONEY ORDERS, CASH AND STAMPS will be accepted. NO C.O.D.s.

UNIVERSAL MODEL AIRPLANES, INC.

4016 CHURCH AVENUE
BROOKLYN, N.Y. (Dept. M-4)

4 TUBES of CEMENT 5¢

Full-Size, 40c Value - All 4 tubes ONLY

Not more than 4 tubes for 5c to a Customer!

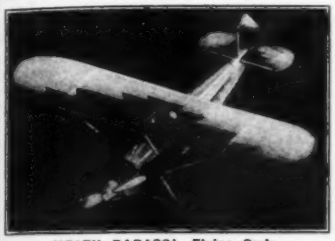
Tubes shown actual size.

Here's our **greatest** Monthly Special offer—four full-size (see picture) tubes of our new, secret "Dri-Qwik" Cement—for only 5c (worth 40c!) provided you buy at least $1 worth of **supplies** (kits **not** included) from this **advertisement on or before** midnight, June 30, 1933! This new, secret cement-formula promises you the BEST model airplane cement you ever used. It is clear, extremely lite-weight, dries quick, holds tight, easy to use and at this SPECIAL PRICE—is a sensation! Made and intended **only** for model building purposes! Now hurry—remember, to buy the four big tubes (worth 40c) for only 5c, you must order famous quality B.P.A. supplies to the amount of $1 or over **before** midnight June 30, 1933. Tell all your friends about this great Special—and get your cement now! (Watch our ad each month for Bargain offers—it will pay you!)

Get Your B.P.A. CATALOG FREE Send 3c stamp to cover mailing cost. You'll be surprised to see this beautiful Catalog which PICTURES our many wonderful supply items. Send stamp with your order NOW!

HERE! B.P.A.'s. New Deluxe 25¢ FLYING SCALE MODELS!

BEST 25c kits on market! FULL-SIZE, 3-view plans, COMPLETE KITS with banana oil, cement, formed wire parts, balsa, Jap tissue, **turned** balsa wheels, etc. Packed in sturdy cardboard boxes. 25c each plus 5c postage on order for **only one** kit. We **pay** postage on order for **2 or more kits!**



HEATH PARASOL Flying Scale
A marvelous flyer. 25c plus 5c postage.

FOKKER D-7 Flying Scale
What a kit! 25c plus 5c postage

CURTISS FALCON Flying Scale
Wonderful biplane flyer, 25c plus 5c postage.

NIEUPORT SCOUT Flying Scale
War-time fighter, 25c plus 5c postage

SUPPLIES!

Modelists of America! A Group of Chicago Business Men (All Model builders) have JOINED HANDS to give you business-like service—high quality at low cost—on supplies! Get acquainted with this NEW KIND OF SUPPLY COMPANY—send us an order today—like thousands are doing! A trial will convince you! SATISFACTION GUARANTEED, OR MONEY BACK, or EXCHANGE!

BALSA STRIPS 24" Lengths

1/16" square, each	.01	.12 for 5c
1/16" x 1/8", each	1c	.10 for 5c
3/32" square, each	1c	.9 for 5c
1/16 x 1/4", each	1c	.8 for 5c
1/8" square, each	1c	.8 for 5c
3/32 x 3/16", each	1½c	.8 for 8c
1/8" x 3/16", each	1½c	.8 for 8c
1/8 x 1/4", each	2c	.5 for 7c
1/8 x 3/8", each	2c	.5 for 7c
1/4 x 1/2", each	3c	.5 for 10c
5/8" square, each	4c	.5 for 16c
3/8 x 1/2", each	5c	.5 for 20c
1/2" square, each	6c	.5 for 25c
1 x 1", each	13c	.4 for 45c

Other sizes to order.

BALSA STRIPS 36" Lengths

1/8" square, each	1c	.6 for 5c
1/8" x 1/4", each	2c	.6 for 10c
3/16" square, each	2c	.5 for 9c
1/4" square, each	3c	.5 for 12c
1/8 x 3/8", each	2c	.5 for 9c

SHEET BALSA

	24"	36"
1/32 x 2"	3c	
1/16 x 2"	4c	5c
1/16 x 3"	6c	
1/16 x 4"	9c	
3/32 x 2"	4½c	6½c
1/8 x 2"	4½c	6½c
3/16 x 2"	6c	9c
1/4 x 2"		11c

PROPELLER BLOCKS

3/8 x ½ x 6", each	1c	.6 for 4c
1/2 x ⅝ x 6", each	1c	.6 for 5c
9/16 x ⅞ x 7", each	2c	.6 for 10c
3/4 x 1¼ x 8", each	3c	.3 for 8c
7/8 x 1¼ x 8", each	4c	.3 for 10c
3/4 x 1½ x 8", each	5c	.3 for 13c
3/4 x 1¾ x 10", each	6c	.3 for 15c
1 x 1½ x 8", each	7c	.3 for 18c
1 x 1¾ x 10", each	8c	.3 for 21c
1 x 1½ x 10", each	9c	.3 for 24c
1 x 1½ x 12", each	10c	.3 for 27c
1¼ x 1½ x 12", each	13c	.3 for 35c
2 x 2 x 12", each	17c	.3 for 48c

PLANK BALSA

1 x 3 x 36"	35c	2 x 6 x 36"	80c
2 x 3 x 36"	55c	2 x 6 x 40"	95c

BAMBOO

1/16 x 1/4 x 12"....1c ea., 6c per doz.
1/16 x 1/4 x 15"....1c ea., 8c per doz.
1/16 sq. x 12"....4 for 1c, 36 for 8c

JAPANESE TISSUE

White, 19 x 26".....4c per sheet
36c per doz.

Red, yellow, green, blue, black, orange and khaki colored Jap tissue, 20½" x 24"
5c per sheet 48c per doz.

THRUST BEARINGS

Small size .. 2c each; per doz. .. 18c

BEST GRADE RUBBER

No. 20 sq. (.05")	3 ft. for 1c
1/32 x 1/16"	3 ft. for 1c
1/32 x 1/8"	3 ft. for 1c

DRI-QWIK CEMENT

Large size tube	10c
Pint	85c

BANANA LIQUID

1 oz. bottle	7c
2 oz. bottle	10c
Pint	60c

ACETONE

2 oz. bottle	10c
Pint	75c

ALUMINUM TUBING

1/16" dia., per ft.	8c
3/32" dia., per ft.	8c
1/8" dia., per ft.	10c
3/16" dia., per ft.	11c
5/16" dia., per ft.	13c

CELLULOID WHEELS

¾" dia., per pair 6c
1" dia., per pair 7c
Above two sizes in black, white, blue, red. 1-3/16" dia.—(Black only) per pair 8c
1¾" dia., per pair 10c
1⅞" dia., per pair 16c
Above two sizes in blue, white, black, green, yellow.
3" dia. Jumbo wheels (Black only), per pair 30c

CELLULOID DUMMY MOTORS —9 cyl.

1¼" dia.	18c
2" dia.	22c

STREAMLINED WHEEL PANTS

Large size to fit 1⅞" and 1⅝" dia. wheels, pair 29c
Small size to fit ¾" and 1" wheels, pair 15c
N.A.C.A. Cowling, 2" dia., each .. 14c

DOWEL RODS

1/16" dia., 24" long 8 for 5c
1/8" dia., 30" long 7 for 5c

SHEET ALUMINUM

.006" thick, per sq. ft. 12c
.010" thick, per sq. ft. 18c

CELLULOID SHEETS

4 x 6" 3c

MUSIC WIRE

Straightened and cut to 2-foot lengths. 2c per length .014", .016", .018", .020", .022", .024", .029", .033"

WASHERS

Per doz. 3c

PROPELLER SHAFTS

Each 1c

How To Order — Send No Money!

Order kits or supplies the convenient C.O.D. way—send no money, mark coupon or your letter "COD" and pay postman **on delivery.**

REMITTANCE RULES: (1) No order under 50c accepted. On supply orders up to $1.50 add 15c packing, postage. Add 10% on orders over $1.50. West of Mississippi, add 10c extra to above charges.

Order C.O.D., or Remit cash by postal or express money order. No CHECKS accepted! (2) We pay postage, insurance on orders of $4 or more, except on balsa planks. (3) Canadians add 25c on orders up to $1.50, 15% on orders over $1.50. No Canadian coin accepted. Use International Money Order! Print order clearly. Satisfaction guaranteed, or exchange made, or money refunded.

Use This Coupon For Kit Orders Only!

BALSA PRODUCTS CO. of AMERICA
1319 So. 5th Ave., Div. 34, Maywood, Ill.

( ) Send C.O.D. kits checked below. I will pay postman for kits, plus C.O.D. fee, postage.
( ) I enclose $.... for kits checked below. Also 5c for postage. If I order 2 or more B.P.A. kits, you will send them prepaid.

Heath ( ) Fokker ( ) Curtiss Falcon ( ) Nieuport Scout ( )

NAME .....
Street .....
City ..... State .....

Order supplies on postal or on sheet of paper

BALSA PRODUCTS CO. of AMERICA

DEALERS!

Write on letterhead today for Special Discounts. BIG PROFIT handling B.P.A. supplies. REAL SERVICE! Deal with BUSINESS MEN!

WRITE YOUR SUPPLY ORDER ON A LETTER OR GOV'T POSTAL—DO IT NOW!

UNIVERSAL

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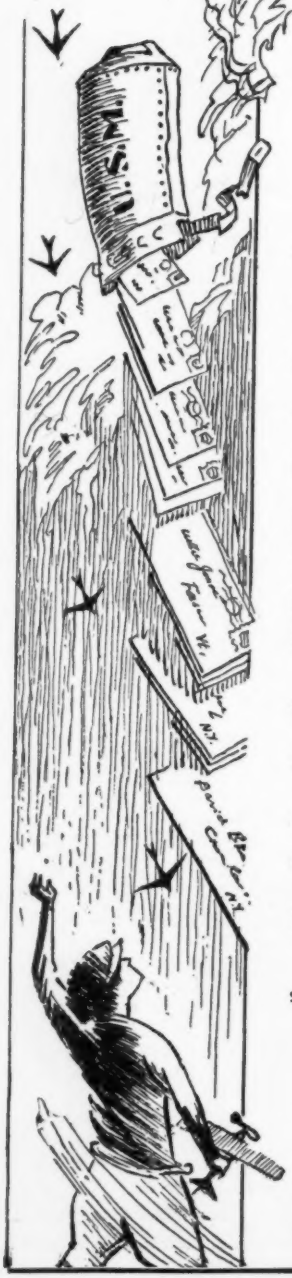
Vol. VIII *No. 4*



Edited by Charles Hampson Grant

CONTENTS

APRIL—1933

In Our Next Issue

Just what you have been wanting. Build this World's Record Fuselage Model, by Gordon Light, who tells you how to construct the ship that won the Wakefield Trophy in 1932 with a flight of 25 min., 53 sec.

The Fokker F-10 A For the Scale Model Builder, by Robert Anderson, provides data and plans from which you can build a beautiful scale model of a famous transport plane in a few fascinating hours.

How to Build a Record-Breaking Twin Tractor, gives complete instructions and plans to construct an outdoor twin tractor designed by Charles H. Grant, that holds the official world's record of ships in its class, which it established in 1931. (Designed 1 oz. for every 50 sq. in., of wing area).

The amazing story of Capt. Jack Swaab's experiences in the World War, is continued by Orville H. Kneen.

A large number of other interesting articles, editorials and drawings by Mr. Howard McEntee, Stockton Ferris and other favorite authors, will provide you with useful information and great pleasure.

Order your copy of UNIVERSAL MODEL AIRPLANE NEWS from your newsdealer now, or send $1.65 for your year's subscription to this office, 125 West 45th Street, New York City. Canadian subscription, $2.00 a year, all other countries, $2.50.

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NATIONAL Announces a New Achievement in FLYING SCALE MODELS

Greater Value at Less Money!

A radically new idea (*) that provides

. . . . . a thrill for beginners

. . . . . a welcome improvement for the experienced craftsman

The development of cambered wood (*) now makes it possible for you to build All-Balsa Flying Scale Models without sacrificing the lightness of tissue-covered models, at the same time eliminates the necessity of building up delicate frame construction. This exclusive National feature saves half your time, brings you simpler construction, and more rigid, realistic flying models. It eliminates warpage and twisting, and minimizes crack-ups.

(*) National controls this exclusive method of "Cambered Wood" which is fully protected by copyrights.

22-Inch BOEING-X-P936

Flying Scale All-Cambered (*)-Balsa Model—Weight 1¾ oz.

This kit contains finished cambered balsa fuselage in authentic color, finished non-breakable cowling, and ready-shaped wing, tail and rudder correctly colored, finished pants and landing gear, wheels, finished prop, insignia, motor, windshield, headrest and guywires, ready to assemble. Colors — olive drab and orange. This new finished cambered all-balsa fuselage brings that realistic appearance, provides stability seldom obtained before by model builders. The simple assemblage is explained by instructions enclosed with each kit..

$1.95

Plus 20c for postage, packing and insurance

LOENING FIGHTER

The Loening 1918, two-seated fighter, was a 100 percent American Wartime plane. Built during the closing months of the war, its many interesting features place it on the honor list of war planes. It is particularly adaptable to modeling, and has proven an excellent flyer with astonishing climb—as did the real ship itself.

CURTISS ROBIN

This well-known cabin monoplane has been selected as another ship to model in National All-Balsa cambered (*) construction because of its excellent flying qualities. Its design, wing area, and balance all lend to making it a corking flyer in 12" flying scale model as here pictured.

Complete Kit

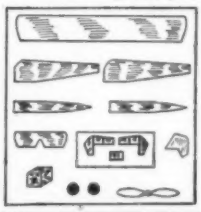
Think of it! An all-cambered (*) balsa flying scale model kit for 25c. It's a thriller to build — a marvel to fly. As light as any paper-covered model you ever tried to build, and so simple to construct; all parts precision cut to shape (not just stamped out). All you have to do is cement together. See illustrations of parts. Kit includes cement, rubber, wire parts, wheels, struts, insignia, and prop ready to assemble and fly, with complete detailed instructions to guide you **25c**

(plus packing, postage and insurance 10c)

Semi-Finished Kit

For those who want quicker action in construction, we offer the 12" Loening model in semi-finished kit. This kit contains assembled fuselage, shaped cambered wing, shaped tail and rudder, finished prop, all in correct colors, blue, yellow, and white, insignia, rubber motor, wire parts, struts, wheels, and cement. A complete instruction sheet guides you in its quick assembly —and off to flight in no time **50c**

(plus packing, postage, and insurance 10c).



Ready To Fly

You can now buy these beautiful 12" all cambered balsa flying scale models —complete in color with insignia, ready to fly—(see pictures). The most beautiful and sturdy models you ever laid eyes on. Complete to the last detail. Just wind it up and watch it soar. Can you resist them for the unheard of price of **$1**

(plus 25c packing, postage and insurance.)

Complete Kit

You can now build this flying scale model from National's all-cambered (*) balsa kit with each part precision-cut to shape, ready to assemble fuselage, wing, and tail. Kit contains wheels, rubber, wire parts, windows, cement, and a full detailed instruction sheet. These new designed kits are the quickest and easiest you ever built—free from warpage or twisting and sure flyer. Kit complete only **25c**

(plus packing, postage and insurance 10c).

Semi-Finished Kit

The semi-finished 12" Curtiss Robin has fuselage built up complete with nose block, full cambered ready-to-attack wing, tail and rudder—all in colors, red and yellow, ready to use prop, rubber motor, wire parts, struts, wheels, and cement to glue together. The detailed instructions guide you in its simple assembly. And then!! what a Flight!! It's a wow for only **50c**

(plus packing, postage and insurance, 10c)

JIG SAW PUZZLES for AVIATION FANS

A new series of wartime air combat pictures in beautiful colors, mounted on plywood; over 100 pieces; interlocking.

No. 1 "Rickenbacher Downs Two" **50c**

plus 10c for postage, packing and insurance.

A FEW NATIONAL QUALITY SUPPLIES

at special quantity prices
For Clubs, Schools and quantity Buyers.
(Good to May 1st only)

Grade A Balsa

50—1/16	x 1/16	x 18....	.10
50—1/16	x 1/8	x 18....	.12
40—1/8	x 1/8	x 18....	.10
50—1/8	x 3/16	x 18....	.20
25—1/32	x 2	x 18....	.40
25—1/16	x 2	x 18....	.45
20—1/16	x 2	x 18....	.55
20—1/4	x 1/4	x 18....	.20
10—1/2	x 1/2	x 18....	.25
10—1	x 1	x 18....	.75

CLEAR CEMENT

12—1 oz. bottle ..... .85

JAP TISSUE

36 sheets 20½ x 24½ White and assorted colors ..... .65

RUBBER

100 ft. 1/32 x 1/8..... .30
100 ft. .045 ..... .20

CLEAR DOPE

12—1 oz. bottle ..... .75
12—1 oz. bottle Colored dope ..... .85
12 pkgs. assorted wire and metal parts ..... .65

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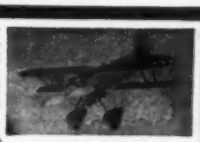
HELL-DIVER



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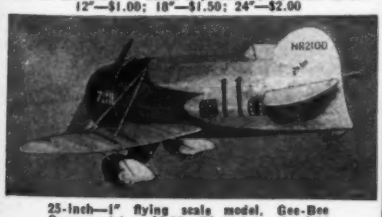

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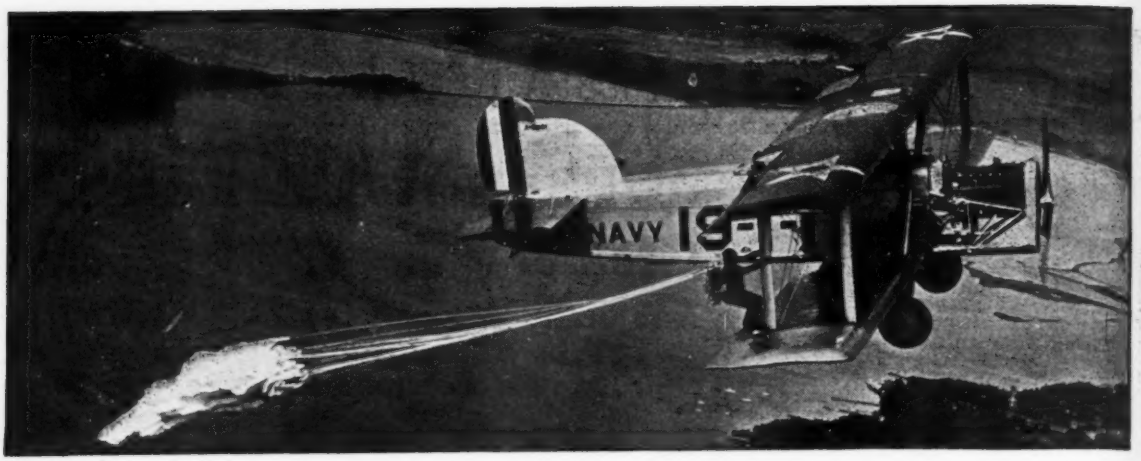


Too late to change your mind. A Pull Off. (Official U. S. Navy photograph).

Bail Out!

The Story of Some Critical Moments Experienced by Uncle Sam's Air Pilots

By H. Latane Lewis II

BAIL out! How many times, in what tense situations, has that command been given! It is the aviator's terse order to jump with a parachute.

Imagine yourself inside the body of a great air monster, 4,000 feet above the earth. The motors are droning along smoothly and the ship is riding easily. Suddenly a violent shiver passes through the craft. Pandemonium breaks loose. Before you have had time to ascertain what has happened, the curt command to jump is barked above the bedlam of sound.

That was the experience of a radio operator at Langley Field not long ago. He was deep in the bowels of a huge army bomber, operating the radio, when a collision with another plane tore away the right wings. In an instant, the once-proud ship was out of control. Her pilot gave the order to jump and went over the side, closely followed by a mechanic who was in the cockpit with him.

The radioman could not get out so easily. He was down inside the ship with a radio helmet holding him to the radio set. It was an awkward position. Working hurriedly, he divested himself of the cumbersome paraphernalia and made his way to the cockpit. Climbing out of the careening plane, he was swept clear by the terrific blast of air and went tumbling head over heels toward the Lafayette River far below. Allowing himself time to clear the plane, he pulled the rip cord. His chute opened normally and he landed with a splash, but was unhurt. The other two fliers were equally fortunate.

1st Lt. Glenn M. Britt, whose emergency leap was the biggest thrill at the American Air Races this year.

What are the sensations of a man when he is forced to leap out into thin air and trust all to a mere few yards of silk? Lieut. Julian Haddon, who, after becoming insensible through lack of oxygen, dropped 25,000 feet straight toward the ground and regained consciousness to discover that his ship was in flames, states that "the pilot must make his decision, and act accordingly, so quickly that he has little time for fear."

Lieut. Norme D. Frost, who leaped from a plane which was out of control and falling in a rapid spin, had this to say concerning his emotions: "All the time I was feeling for the rip cord I was forcing myself to hurry, for I was sure that I would hit the ground before I could make anything happen. All my efforts seem to move like a slow motion picture on the screen. I didn't feel any fear at any time; I just seemed to realize what was coming if I didn't get out and get that chute working."

Frost had been practicing acrobatics in a high speed pursuit plane over Wheeler Field in Hawaii. At an altitude of 5,000 feet he rolled the powerful little ship over on its back and kicked it into an upside-down spin. This is one of the most violent maneuvers that an airplane can perform. As the plane roared downward, the spin became tighter and faster with each turn. After a thousand feet of being whirled around like a top, with his head down, Lieut. Frost attempted to bring the ship out.

IT did not respond to the controls. It was now falling at terrific speed and the wind shrieked on the struts and wires. For two thousand feet he fought desperately to bring his unmanageable mount back into normal flight, but in spite of everything he could do, it continued its mad plunge. Then Frost decided it was time to get out.

"I was spinning so fast that the different objects on the ground formed many concentric circles and I could not distinguish a single object," he stated. "It was all a whirling blur and I could not tell how close to the ground I was, but I did realize that I had time to release myself from the ship.

The big moment arrives. Head first into space. (Official U. S. Navy photograph).

"I pushed off the rubber band that safetied the buckle on the belt and with my left fingers pulled the buckle to release it. Due to the nature of the spin, the centrifugal force was terrific and tended to throw me outward and I hung heavy against the belt. My eyes felt the pressure and seemed like they were going to pop out, but I could see everything about the plane all right. As the buckle of the belt was pulled, the tips of the middle and ring fingers on my left hand became caught in the metal loop of the buckle and acted as a wedge which prevented the loop from slipping through the other half of the buckle and releasing me from the plane. My fingers were pinched numb and I looked in my lap and saw them caught there. I pulled on the bottom of the seat with my right hand to lessen my weight against the belt but the centrifugal force was too great and I could not move myself enough to loosen the buckle and free my fingers. I realized the situation and knew the ground was coming fast, so I grasped my left wrist with my right hand and had to yank hard twice to tear my imprisoned fingers loose. It was only then that the belt opened, and I was thrown out instantly like a rock from a catapult, face toward the sky and head downward.

Hope returns; the chute starts to open. (Official U. S. Navy photograph).

"I soon found the rip cord to my parachute and pulled it out, the chute opened at once and I floated only about 800 feet from the ground. I flew out of the plane so quickly that I did not know which way it or I went and never saw it again till after I landed. I was in the air in my parachute only long enough to slip it to prevent landing in the gulch which was coming towards me. I tried to twist myself around some so as to land properly, but had not time enough, as I then hit the ground very near the edge of the gulch. I was not hurt in the least, although it was an awful jolt as I fell in some backward position."

Frost regarded his jump as just a part of the day's work. As soon as he had had his fingers dressed, he went up in another ship and stunted some more.

Spectators at the All-American Air Races at Miami in January witnessed a thrilling demonstration of what parachutes are for.

THE crack stunt team of the Marine Corps from Quantico was putting on a breath-taking exhibition of acrobatics above the grandstand. Twisting, weaving, like whirling dervishes the six little Boeing fighters cavorted about the sky, their silver bodies flashing in the afternoon sun.

Just before the end of the show, they came roaring over the grandstand at tremendous speed. Up, up went their noses in perfect unison until they were standing on their tails; then, over on their backs into a loop. At the top of the loop, still in tight formation, they half-rolled.

Suddenly, onlookers saw one of the planes stagger drunkenly as it was caught in the slip-stream of the preceding plane. In an instant, it whipped into a vicious outside spin and hurtled toward the earth at terrific speed.

Inside the cockpit of the plunging plane was Lieut. Glenn Britt, one of the outstanding pilots of the Marine Corps. Britt was fighting desperately to regain control, although he knew that there was little chance of it.

From 1,200 feet down to 200 feet, the plucky leatherneck rode the madly spinning ship. Then he realized it was useless and decided to bail out. As he leaped, the machine suddenly careened against him. Horror-struck, spectators held their breath. He was now so close to the ground that there would not be time for the chute to open. Then they saw the flyer kick himself free. The terrific momentum with which he was hurled off into space enabled the silk canopy to unfurl. It blossomed above him, saving his life by a split second.

He landed without so much as a scratch to show for his harrowing experience. His plane crashed to the ground a few feet away and was reduced to matchwood.

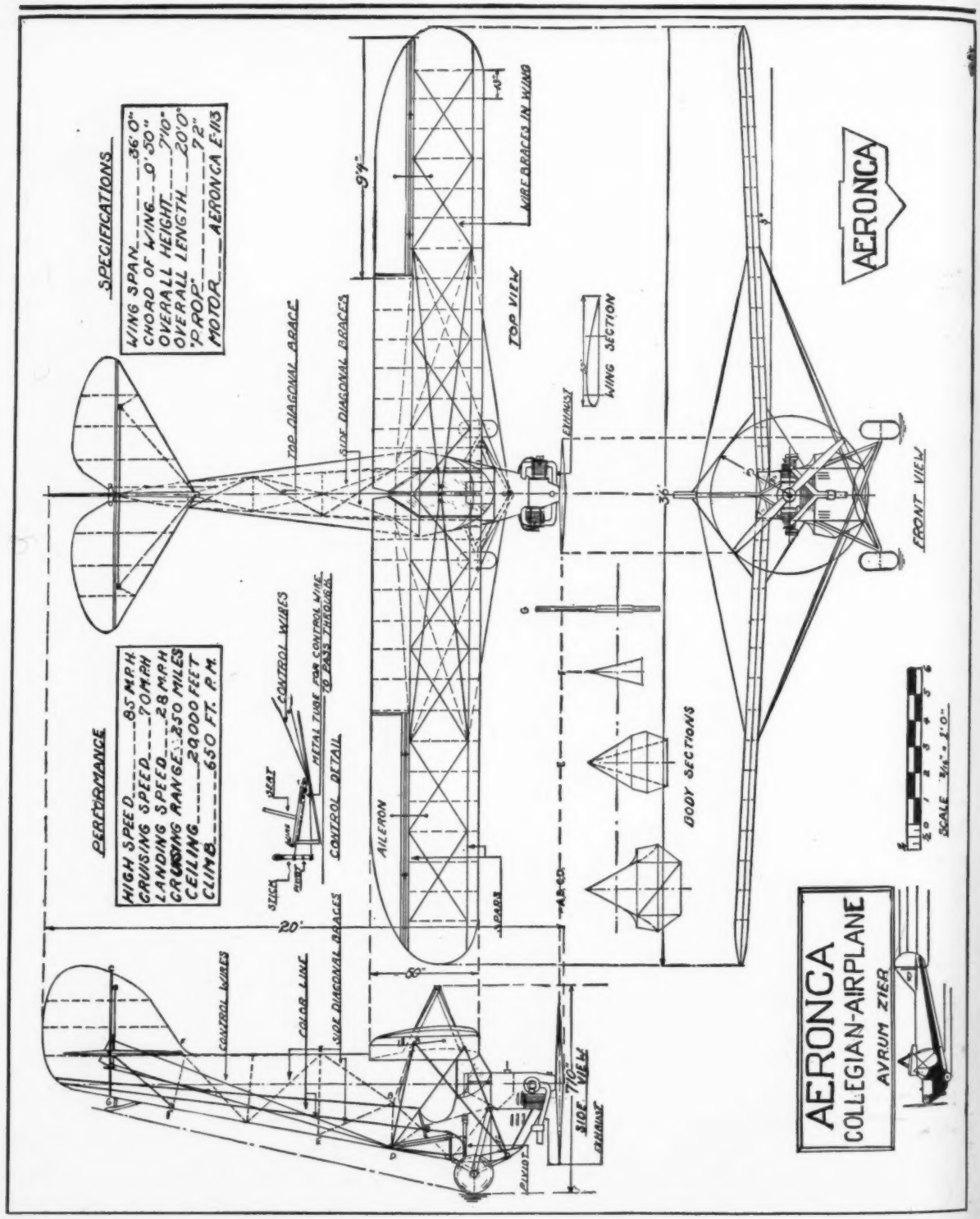
Fog has been the cause of a number of forced jumps. Paul Collins, famous air mail pilot, had to abandon ship when he became pinched in over mountains in Pennsylvania and his plane fell into a violent tailspin. *(Continued on page 47)*

W. D. Strayham frees himself from his harness.

The Aeronca Collegian

HERE is one of America's foremost light planes. It is equipped with a 36 h.p. engine and seats two persons. The weight empty is 470 pounds. The fuselage and tail units are of welded steel tubing. The wings are all-wood construction, except the ailerons, which are built entirely of duralumin. A Clark Y wing section is used, a well known and efficient section.

This plane makes a very fine flying model and those with reasonable skill and patience may complete an effective-looking detail scale model from these plans. Take care with the fuselage as it is of irregular and unusual shape.

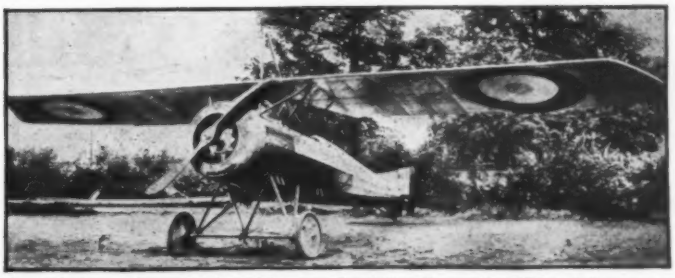


Fighting Wings

America's Second Living Ace's Own Story of How He Attacked an Enemy Airdrome and Successfully Fought Off Ten Fokkers

By Orville H. Kneen
Author of "Flying for Everybody"

PART TWO



One of the early war-time Morane Saulnier Parasols. This picture was taken in France during the War.

YOU will remember I had lost my patrol, when we dived through the clouds. I was alone, and there's no denying I was scared. Below me lay a town, one I could not make out. I was glancing over the side, trying to get my bearings, when poof! a beautiful black mushroom spread over the sky near me. I couldn't hear anything — but seein's believin'! Another burst on the other side. More—and more—on all sides!

Anti-aircraft fire! And I was the target. Black puffs meant high-explosive. One hit, and the war was over—for me. They came too close to be funny. I dipped and dodged, climbed and cussed and tried to recall all the orders about how to get out alive. Anti-aircraft fire is one of those things you get no practice on—until you get over the lines and the enemy gunners get your range.

Here is a Pfalz D.3 captured from the Germans during the War. Pictures of this ship are scarce.

Meantime I searched high and low for the lost patrol. But not a Spad was to be seen. Some ten minutes of this and the idea sunk into my busy but reeling brain that I was carrying on a one-man war against the German fortress of Metz — fairly bristling with guns of all calibre!

Wet all over, I headed into the clouds, revealing myself a novice. The gunners expected me to do this. An explosion under my feet rocked the ship with its "vacuum" but luckily did no damage. Down I fell into this "hole in the sky." It seemed hours before my Spad responded to my frantic motions. Then I climbed into a cloud until I came out on top.

This is a picture of the celebrated Fokker D.8 single seater pursuit, used by the Germans during 1918. It was exceedingly fast and efficient with its 110 h.p. Oberüsel motor.

I headed into the sun and drew a breath. With no more black puffs in sight, I said "Home, James!" and flew for some twenty minutes.

Through the clouds I saw a field so I went down to look it over. There were no planes visible but many chimneys. I jumped at conclusions—a deserted French airdrome! I circled, throttled, began a spiral, glad indeed to land in one piece under my own power.

I was about 600 feet above the field, still thinking how lucky I had been, when my heart began missing on all cylinders. My eyes started popping at the same instant. I saw a dark gray *chasse* plane taking off to greet me and on it were German crosses!

An American pilot in a French Spad, trying to land on a German airdrome! I could recall no rules or orders in a situation like *that*. In fact, I looked to myself like a gone goose.

MEANTIME and in a very few seconds indeed, that gray Fokker was climbing. If I was a goner, I might as well take him along!

I dived straight at him. When he was in range I opened both guns. One gun jammed—as they always did when you needed them most. The other gun pumped hot lead all around the cockpit. As I eased my dive he burst into flames. I circled as he fell, a crimson sheet that turned into black smoke as he crashed on his own field.

By this time, as I drew a couple of breaths, I began to realize that machine-guns were spitting at me. I ducked behind the hangars and looked around to see *an enemy in front of every hangar,* warming up.

For me? Posi-*tive*-ly. I decided in nothing flat to go far, far away from there immediately. I pulled the stick back and my little Spad stuck her nose into the sky. "Top, James," I said this time.

Heading into the sun again I saw what I had done when I got lost. The wind had "crabbed" me constantly eastward, pushing me farther and farther over the enemy lines. I saw dimly that I was at the foot of the Vosges mountains. Then I forgot to kick myself for my dumbness when some beautiful "flaming onions" began reaching their long green phosphorous fingers in my direction. I was mighty glad to get out of *their* clutches.

I corrected my course to allow for the wind and wished I was a lot nearer home, sweet home. Instinct now told me to look out for trouble ahead. I looked—and there it *(Continued on page* 40)

Blaze Air Trails with This Howard "Pete"

A Speedy Little Model of the Famous Racer That Performs Like Its Big Brother

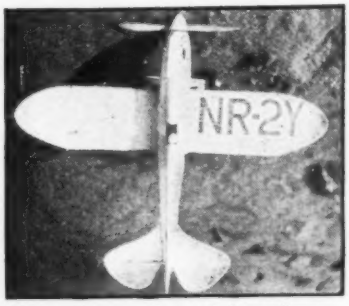
By Stockton Ferris, Jr.

A TINY point of white in the distance, growing larger and larger. The sound of an angry blowfly, a dip and flash of wings and Benny Howard leads the field around another pylon.

This plane is perhaps the fastest racer ever made with the amount of power it has. With only 90 horse power (Wright Gypsy) it put up a performance bettered only by planes of far greater power. Its entire superiority lies in its streamline and small size.

The model set forth herewith was not intended to have much duration and so was made heavily, both to gain speed and to take the shock of its fast landings. There was no way of clocking the model during the tests but from observation and the calculations on paper, the speeds are approximately:—

The finished model "breaks in" its bearings in preparation for the first take-off



Clean lines and careful workmanship makes this a neat model

Specifications

Top Speed—20 plus M.P.H.; Landing—12; Span—15 1/16"; Length—13 5/16"; Weight—1 1/4 oz. (with ballast).

Fuselage

START this first by laying out the longerons and vertical pieces over the drawings. The longerons and cross pieces are cut from the 1/16" flat stock. The front end of the lower longerons consists of a wide piece of 1/16" flat balsa which the rear part joins behind the cockpit.

While this is drying, work on the nose. After the large lower block is shaped, the small upper one is made to fit it. They are both hollowed out before being glued together.

After the two sides of the fuselage are made, they are inverted and the cross pieces put in at stations 2, 3, and 4. This is the only part of the upper longerons that is flat. The bottom longerons are closer together than the upper ones. The rear of the fuselage is sprung together next, but former No. 8 is not put in place until the stabilizer is inserted.

The cockpit cowling is made much like the nose but should be made thinner. The landing wires are attached to this by means of the piece, "B". This piece is a short section of bamboo with a narrow strip of paper rolled near each end, forming shoulders. The thread is tied between these. A little trapdoor is cut from the top of the cowling to get this in place, and later glued back.

The headrest is cut from one piece of wood and the rear portion of it forms the bottom of the fin. The rudder and fin are built right onto the fuselage after the stabilizer and piece No. 8 have been put in place. The formers that hold all the stringers are cut from 1/32" stuff and cemented in place after the framework is dry. The stringers are 1/32" square balsa. Their position is shown on the layout of each bulkhead.

Empennage

THE leading edge of the fin is made from the 3/32" flat balsa and is sanded to a point. The spar is part of former 8 and is 1/16" thick. The rudder has a bamboo outline which ends at the point of the tail piece. The bottom rib of the rudder slants from the spar to this point. The tail piece is put on after the rudder is covered and has a groove in the upper surface to receive the bottom of the rudder.

The stabilizer is made in the same manner as the rudder. Notice that the area of the stabilizer is increased slightly for flying. This is not necessary although it will add to the stability. The stabilizer should be completed (and perhaps covered) before it is put in place. The piece running across the front, which is glued to former 7, might be only tacked in place at first, with very little cement, so that adjustments could be made on the first flights. The negative angle is to improve the flying; true scale is zero.

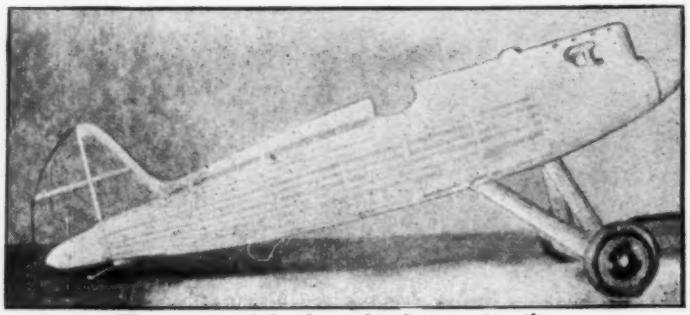
(Cont'd on page 45)

List of Material

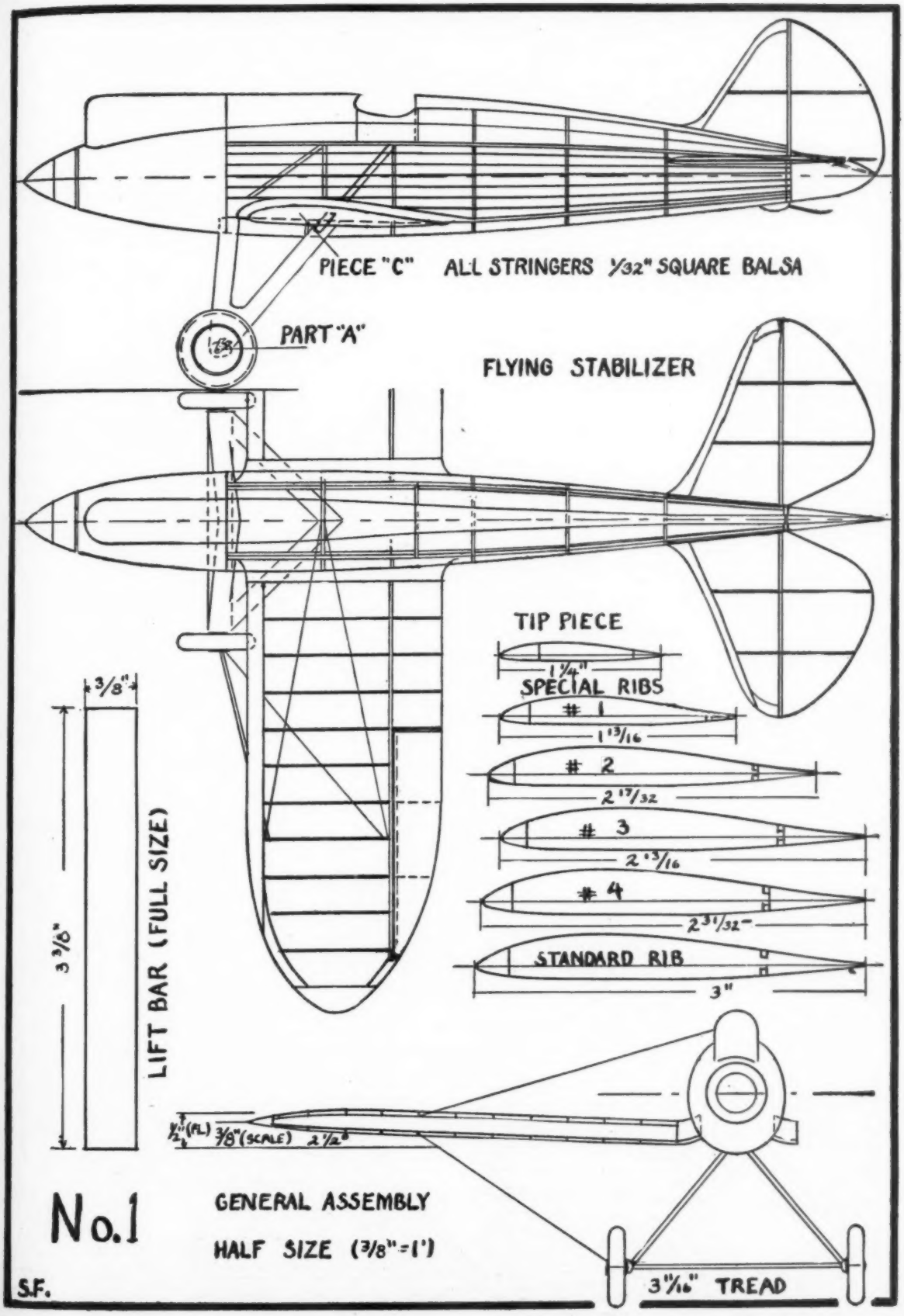
All sizes are given with a margin of safety

Spinner	1" x 1" x 1"
Nose blocks	2⅜" x 1¾" x 1⅝" and ⅞" x ¾" x 2¼"
Cockpit cowl	3" x 1¼" x ⅜" and 3" x ¾" x 9/16"
Wing roots	3½" x ½" x ½"
Headrest	5¾" x ½" x ½"
Tail piece	1⅜" x ⅞" x ½"
Leading edge	12" x ¼" x ¼" Scale prop 5" x ½" x ½"
Flying prop blank, **exact** measurements	6" x ½" x 1"
Sheet balsa	1/32" x 2" x 24" ribs, stringers, formers, etc.
Sheet balsa	1/16" x 2" x 12" longerons, etc.
Sheet balsa	3/32" x 2" x 12" struts, empennage, etc.

Bamboo: White, red, blue and black lacquer or dope; pair of 1⅛" or 1¼" wheels; sheet of tissue; washers; music wire; 40"-60" of ⅛" flat rubber.



The uncovered fuselage showing construction

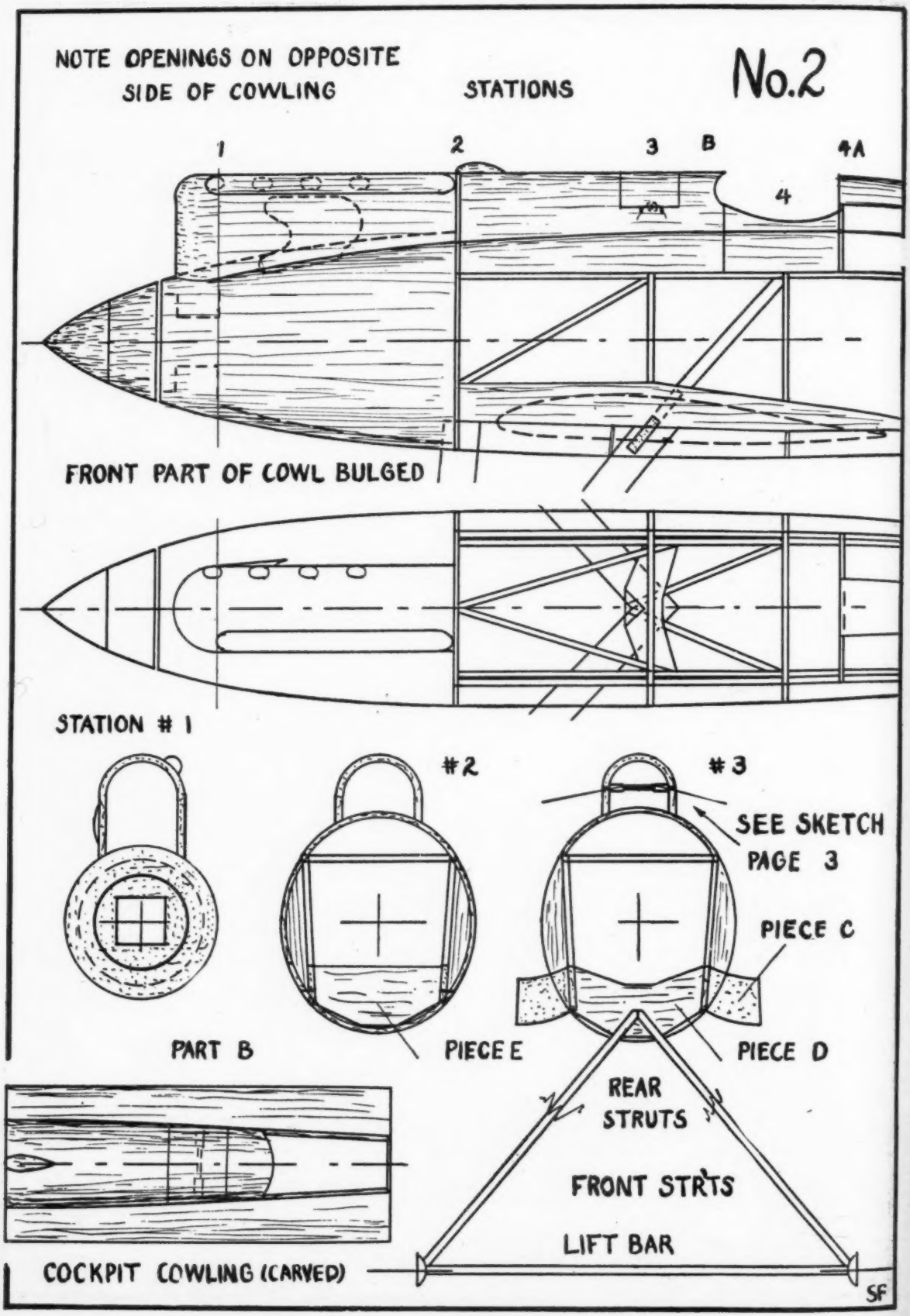


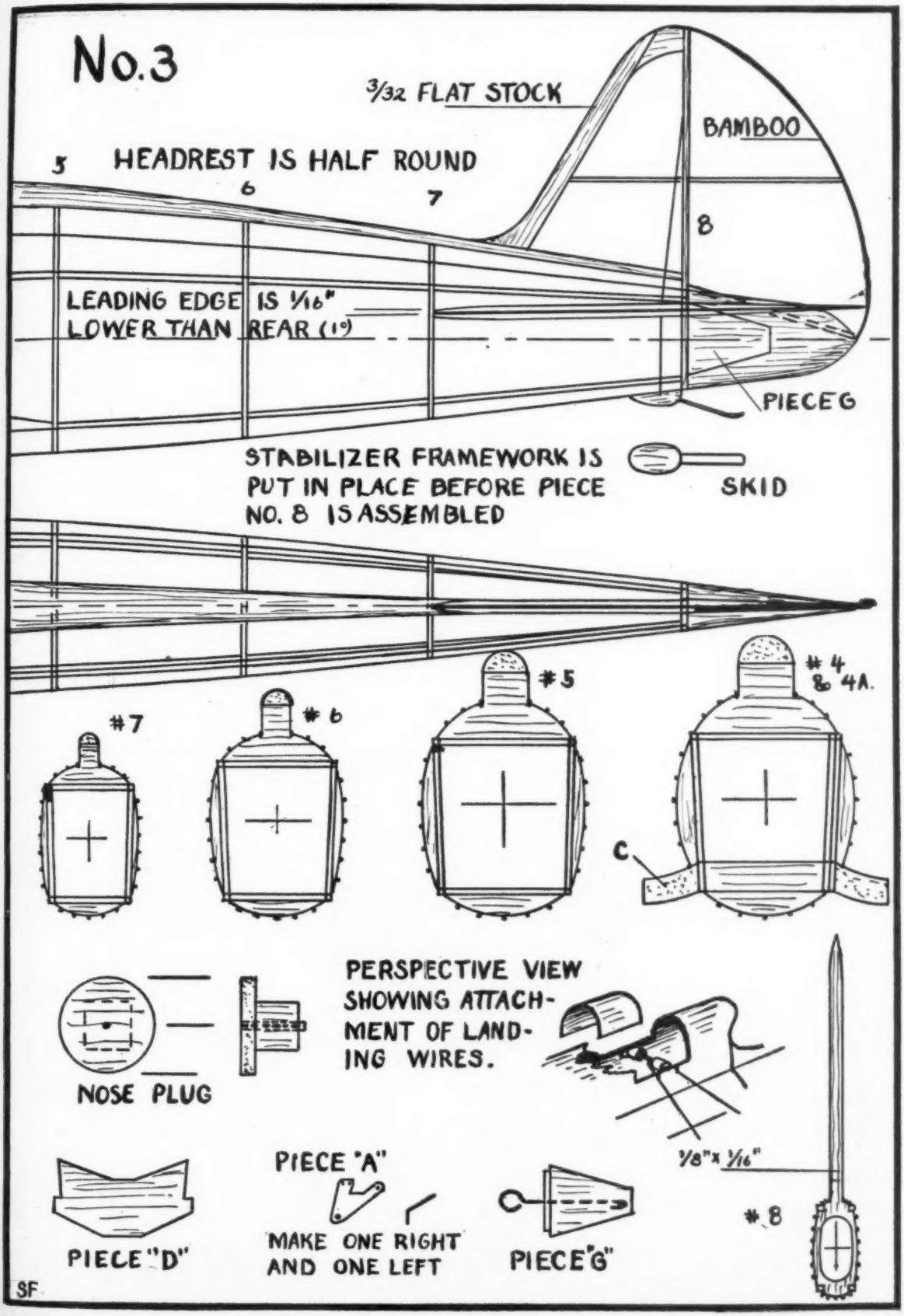
No.1

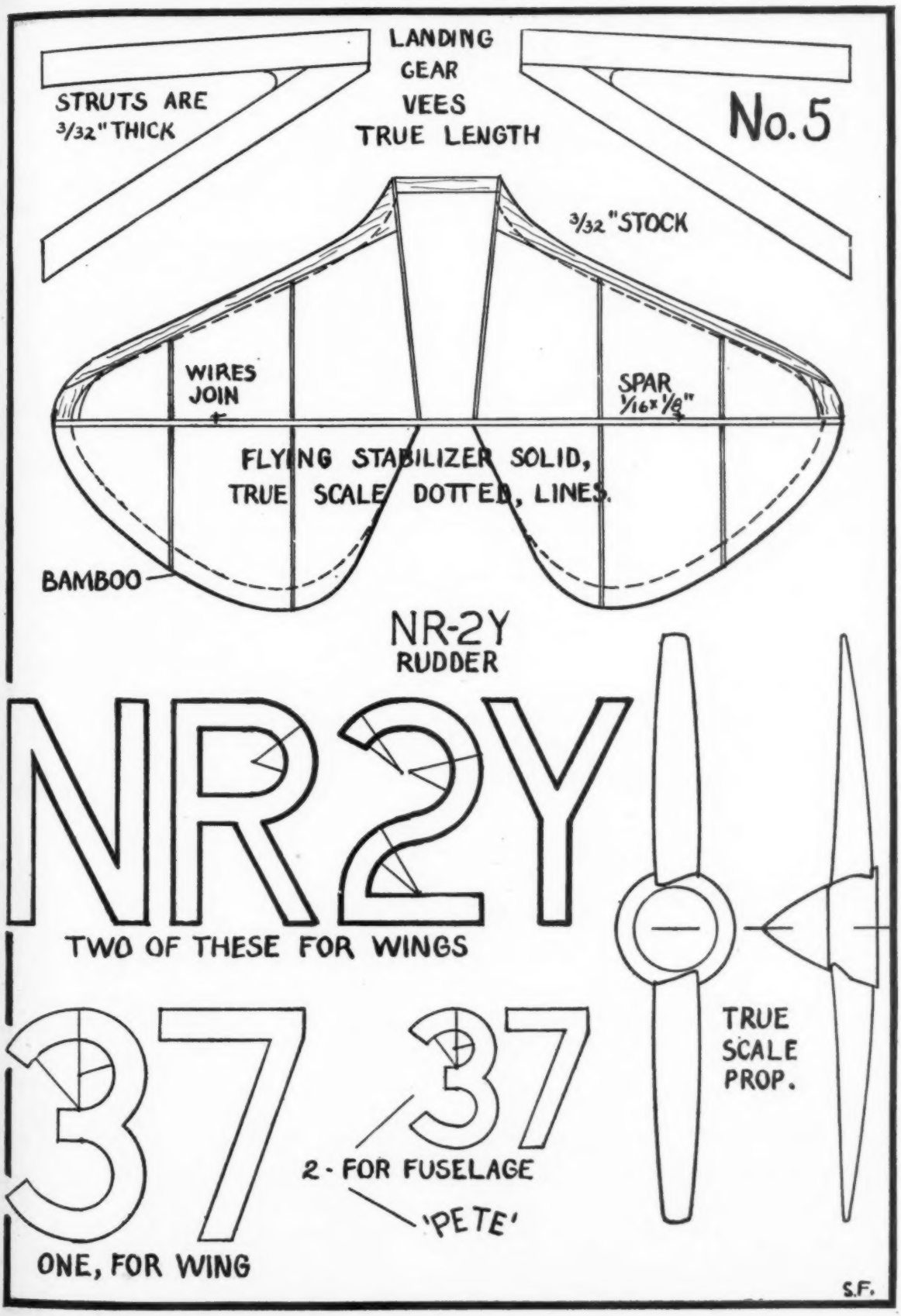
GENERAL ASSEMBLY

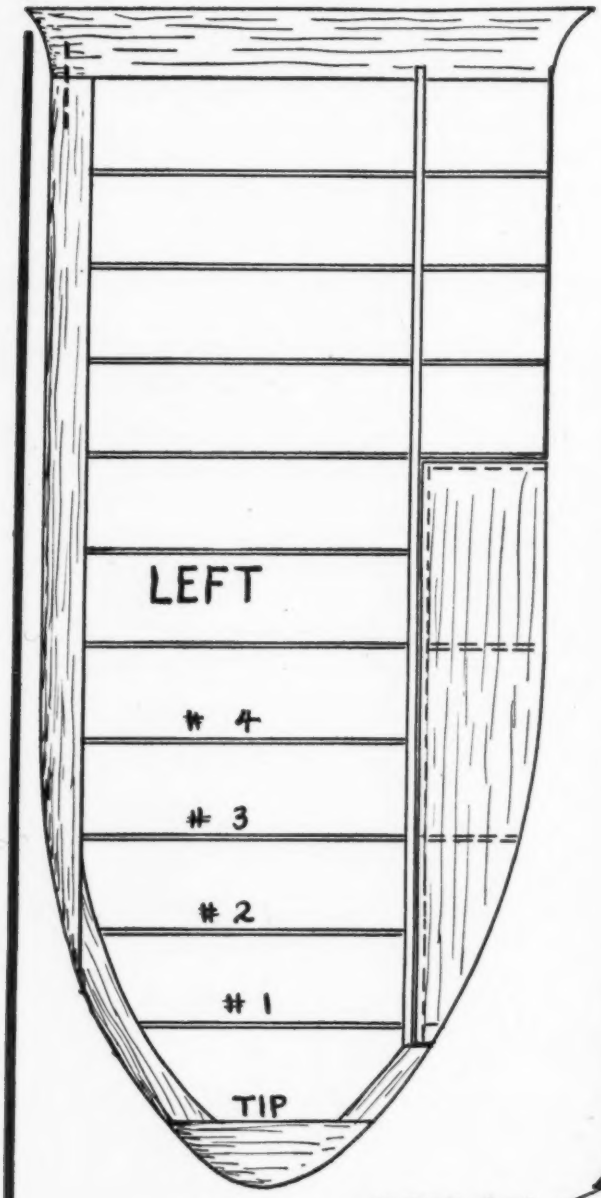
HALF SIZE (3/8"=1')

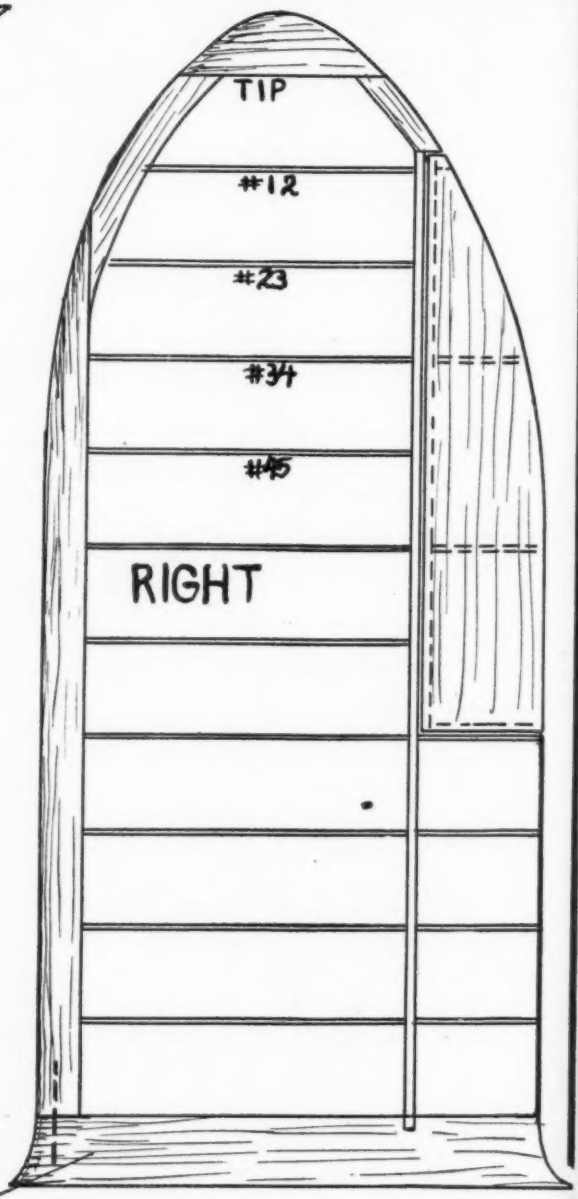
S.F.


NOTE OPENINGS ON OPPOSITE SIDE OF COWLING
STATIONS
No.2
1
2
3
B
4A
4
FRONT PART OF COWL BULGED
STATION # 1
#2
#3
SEE SKETCH PAGE 3
PIECE C
PART B
PIECE E
PIECE D
REAR STRUTS
FRONT STRTS
LIFT BAR
COCKPIT COWLING (CARVED)
SF


No.3
3/32 FLAT STOCK
BAMBOO
5
HEADREST IS HALF ROUND
6
7
8
LEADING EDGE IS 1/16" LOWER THAN REAR (19)
PIECE G
STABILIZER FRAMEWORK IS PUT IN PLACE BEFORE PIECE NO. 8 IS ASSEMBLED
SKID
#7
#6
#5
#4 & 4A.
C
NOSE PLUG
PERSPECTIVE VIEW SHOWING ATTACHMENT OF LANDING WIRES.
1/8" x 1/16"
#8
PIECE "D"
PIECE "A"
MAKE ONE RIGHT AND ONE LEFT
PIECE "G"
SF


LANDING
GEAR
VEES
TRUE LENGTH
STRUTS ARE
3/32" THICK
No.5
3/32" STOCK
WIRES
JOIN
SPAR
1/16 x 1/8"
FLYING STABILIZER SOLID,
TRUE SCALE DOTTED, LINES.
BAMBOO
NR-2Y
RUDDER
NR2Y
TWO OF THESE FOR WINGS
37
37
2 - FOR FUSELAGE
'PETE'
ONE, FOR WING
TRUE
SCALE
PROP.
S.F.





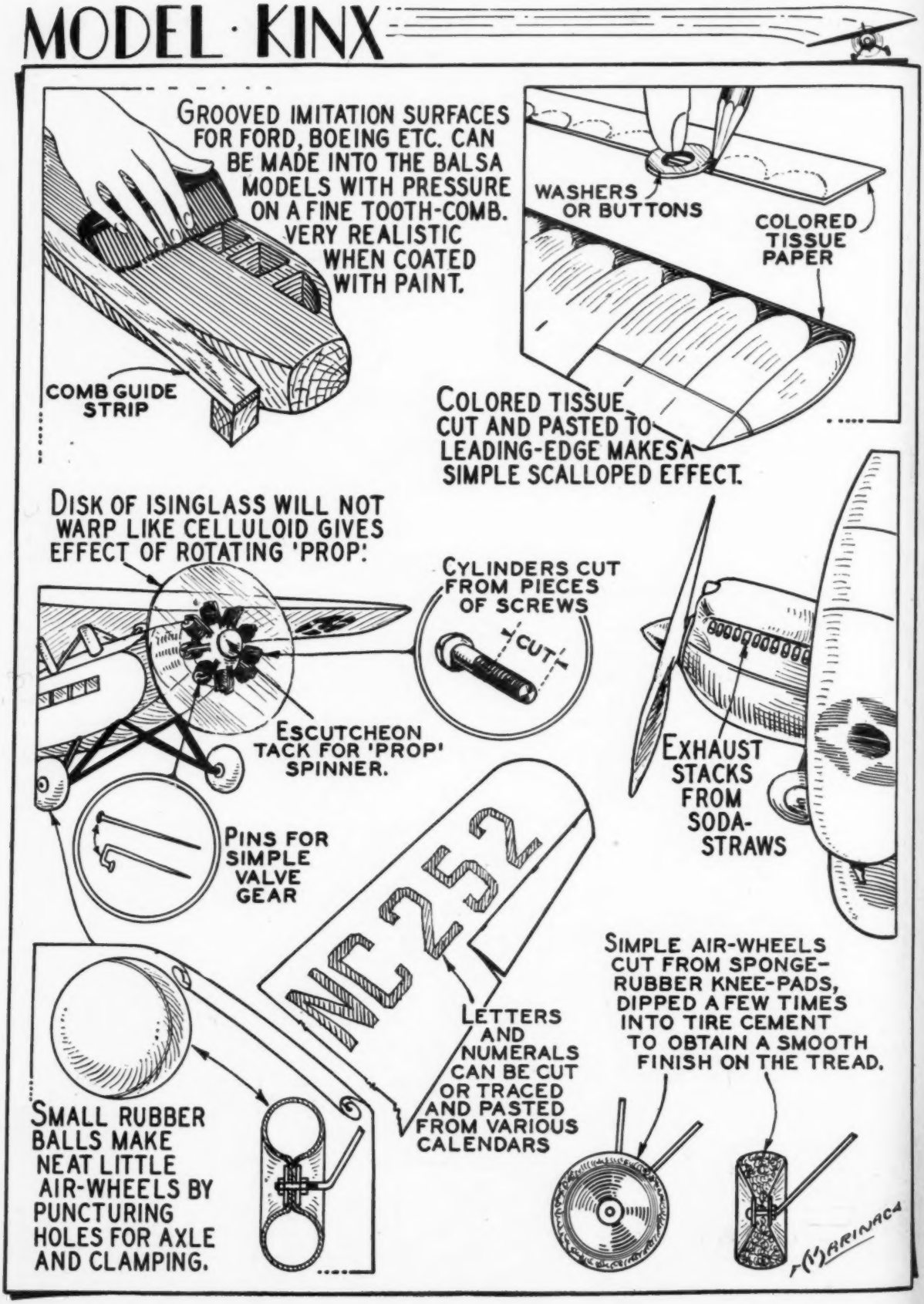
USE STANDARD RIB TEMPLATE TO GET RIGHT SHAPE. MAKE ONE RIGHT AND ONE LEFT.

ADD A TOUCH OF REALISM

No. 4

S.F.

MODEL · KINX

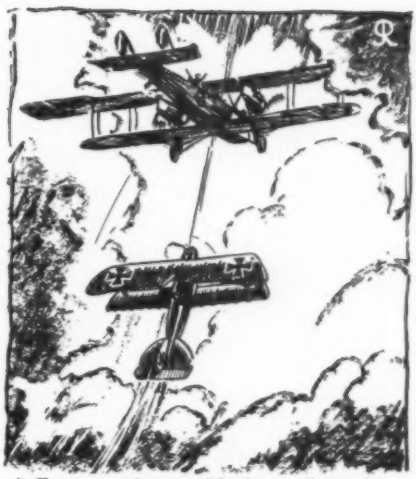

GROOVED IMITATION SURFACES FOR FORD, BOEING ETC. CAN BE MADE INTO THE BALSA MODELS WITH PRESSURE ON A FINE TOOTH-COMB. VERY REALISTIC WHEN COATED WITH PAINT.
COMB GUIDE STRIP
WASHERS OR BUTTONS
COLORED TISSUE PAPER
COLORED TISSUE CUT AND PASTED TO LEADING-EDGE MAKES A SIMPLE SCALLOPED EFFECT.
DISK OF ISINGLASS WILL NOT WARP LIKE CELLULOID GIVES EFFECT OF ROTATING 'PROP'
CYLINDERS CUT FROM PIECES OF SCREWS
CUT
ESCUTCHEON TACK FOR 'PROP' SPINNER.
EXHAUST STACKS FROM SODA-STRAWS
PINS FOR SIMPLE VALVE GEAR
LETTERS AND NUMERALS CAN BE CUT OR TRACED AND PASTED FROM VARIOUS CALENDARS
SIMPLE AIR-WHEELS CUT FROM SPONGE-RUBBER KNEE-PADS, DIPPED A FEW TIMES INTO TIRE CEMENT TO OBTAIN A SMOOTH FINISH ON THE TREAD.
SMALL RUBBER BALLS MAKE NEAT LITTLE AIR-WHEELS BY PUNCTURING HOLES FOR AXLE AND CLAMPING.
F(M)ARINACA

Airplane Maneuver Contest

What Maneuver is Being Executed by the Plane on the Cover?

Winner of February Contest

Do you wish to become a pilot? If you do, you will want to know how and why a plane is made to perform the maneuver pictured on the cover. Enter this contest and learn the basic principles of flight. The Winner of each monthly contest will receive as a prize, the beautifully colored original painting of the cover picture. $100.00 in prizes given to winners of the contest of six monthly pictures.



A Zoom, made possible by a dive, often put the war pilot in a position to deal a death blow.

BEFORE we tell you the big news about the winners of the February maneuver problem, we had better tell the "new-comers" in this contest something about the rules and what is required of them. This is all you have to do.

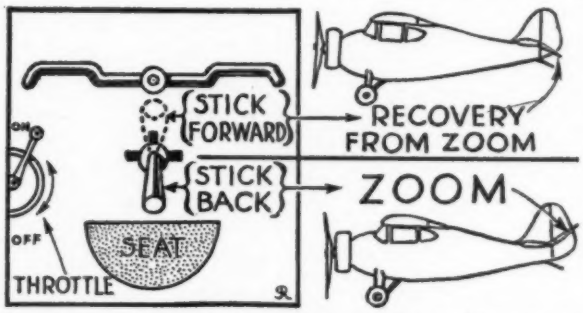
Examine the cover picture carefully and determine what maneuver the plane is executing. This can be done by noting the position and attitude of the plane and the setting of the ailerons, rudder and elevators. When you think you can give the correct answer, write us, naming the maneuver and how it is performed. Also give your name and address, printed or typewritten. The last maneuver in this contest will appear on the cover of the July UNIVERSAL MODEL AIRPLANE NEWS.

Winners will be chosen on the basis of accuracy, neatness and the amount of detailed information given about each maneuver. The awards will be as follows:

Winner of 1st place, $25.00; 2nd place, $15.00; 3rd place, $10.00; 4th to 7th places, inclusive, $5.00; 8th to 19th places, inclusive, $2.50.

All answers to any particular picture must reach this office by the 20th of the current month.

The correct answer for any particular cover will appear in the following issue of this magazine, with diagrams explaining the maneuver.



Here the positions of the controls are shown, when zooming and recovering from a zoom. The latter maneuver is quite important.

Send answers to: *Maneuver Contest,* UNIVERSAL MODEL AIRPLANE NEWS, 125 West 45th Street, New York City.

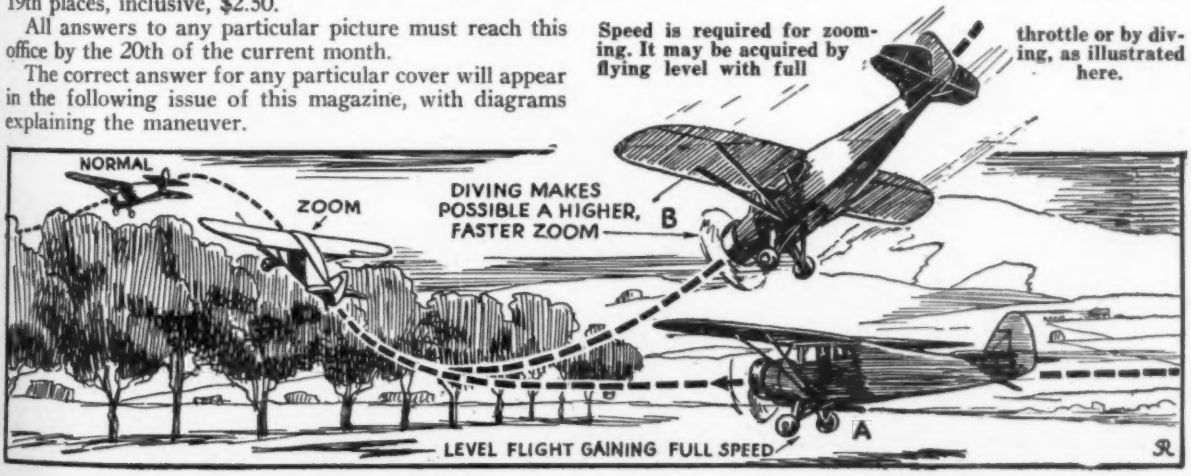
IMPORTANT NOTICE

If you are late in entering this contest, don't be disappointed, for the winner of each separate monthly maneuver problem is awarded the original painting of the cover picture for the particular month of which he is winner.

Also, do not be discouraged if you have not placed well up toward the head of the list of winners and runners-up, for your answers given for the problems to come may raise your average for the six covers to such an extent that you will ultimately place among the winners. Remember, there are nineteen prizes, not including the cover pictures.

After answers to all six problems have been received, the winner will be chosen on the basis of the SIX BEST ANSWERS, regardless of how he or she places in each separate monthly contest. *(Continued on page 36)*

Speed is required for zooming. It may be acquired by flying level with full throttle or by diving, as illustrated here.



Aviation Advisory Board

Conducted by
CHARLES HAMPSON GRANT
Chairman of the Board
Formerly of
The Technical Section, Air Service, U. S. Army

WELL, friends, here we are again with a few interesting questions and answers on aviation and model plane problems.

Robert Schul of 6513 Revere Avenue, Wauwatosa, Wis., wishes to know if the F9C2 is as fast as the Boeing P12E or the Curtiss Hawk P6E. Upon recent information, I find that the F9C2 flies approximately 190 miles per hour, possibly a little more, while the Boeing and Curtiss Hawk fly at a speed of approximately 200 miles an hour. Authentic speed figures on these ships are not available as the government wishes to keep them secret for military reasons.

Alfred Lupin of 1141 Noble Avenue, Bronx, New York, wishes to know how the interplane aileron operates. The strut is attached to the aileron on the upper wing, the lower end is fastened to a bell crank lever within the lower wing, so that when the pilot operates the controls, the bell crank pushes the aileron up or down through the medium of the aileron strut.

Question: Have you published scale drawings of the Fokker D17?

Answer: They appear in this issue, on page 32.

Austin Manning of 703 Hoge Avenue, Ames, Iowa, has several questions which we will try to answer.

Question: A low-wing plane which I have built flies several feet, then hangs on its left wing and stalls. How can I correct this?

Answer: The wing is set too far forward, relative to the center of gravity, and the tail surfaces are probably too small. Weight the nose slightly and increase the size of the tail surfaces so that the fin is 10% of the total wing area and the stabilizer is at least 25% of the total wing area.

Question: Another low-wing plane will fly straight for a short distance, then makes a right turn and lands.

Answer: Probably the right turn is due to the fact that the propeller has unwound and the torque which held it in straight flight while the propeller was turning, has ceased to exist when the motor has become unwound. The model then turns to the right and noses down. This can be corrected by increasing the size of the tail surfaces, giving a larger amount of dihedral to the wing and moving the wing slightly forward.

Lately, several young men have written in to us, asking how they might join the U. S. Army Air Forces, what schools they should go to, etc.

I suggest for information of this nature that they write to the Air Service, U. S. Army, Personnel Division, Washington, D. C. In this way, they can get complete information.

B. ADAMS of 2411 14th Avenue, Scheffield, Alabama, writes to us and wishes to know the best size wood for the longerons of a 55″ model.

If the fuselage is to be paper or cloth covered, I would suggest longerons ¼″ square. If covered with sheets of 1/32″ balsa, make them 3/16″ square.

Question: Would ribs cut out for lightness be all right for such a model?

Answer: Yes, I would make them 1/16 to 3/32 of an inch thick. In order to make them strong, cement tissue paper to both sides of the rib before you cut them out. Then when the lightening holes are cut, they will not split.

Fred Meyer of 141 Lafayette Street, Jersey City, N. J., writes us that his S.E.5 plane always dives steeply in crashes, though it will glide all right. What is the trouble?

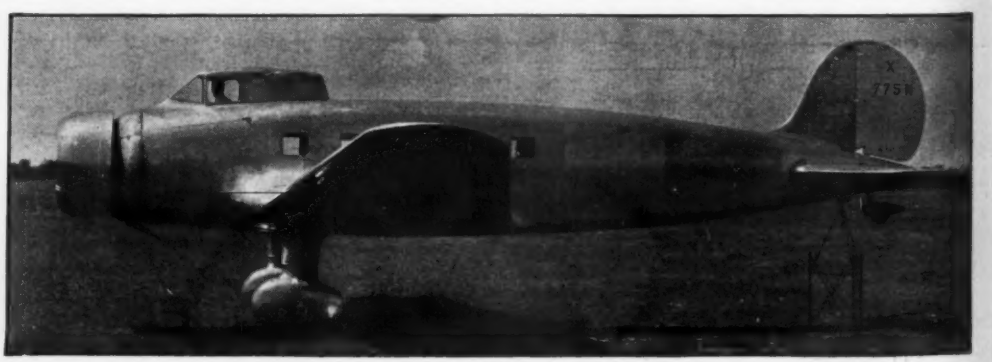
Answer: It is evident that it flies properly at slow speed, as in a glide, but dives when under power. The diving is due to the fact that the stabilizer is set at too positive an angle. The front edge should be lowered slightly. It glides properly with this too positive setting because the wings are ahead of the center of gravity. Therefore, when you change the setting of the stabilizer, move the wings back slightly or weight the nose to bring the center of gravity farther forward. I believe this will cure your troubles.

Question: Will it be possible to overcome a tendency to bank by the use of adjustable ailerons?

Answer: Yes, it will be possible to overcome this tendency by the use of adjustable *(Continued on page 46)*

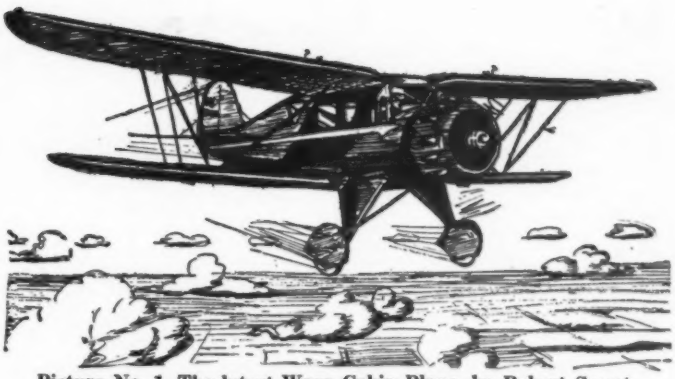
The Clark GA-43

Here is one of the latest commercial transports, built by the General Aviation Manufacturing Corporation. The entire structure is of metal, mostly of high strength aluminum alloy. It has an estimated high speed of 210 m.p.h. It has a retractable landing gear.



AIR WAYS
HERE AND THERE

Get Busy and "Air Your Ways" of Building and Flying Model Planes. In This Column, Space Will be Devoted to the Activities of Our Readers. Let Others Know What You are Doing

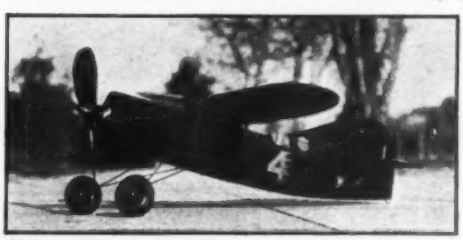


Picture No. 1. The latest Waco Cabin Plane, by Robert Sweet.

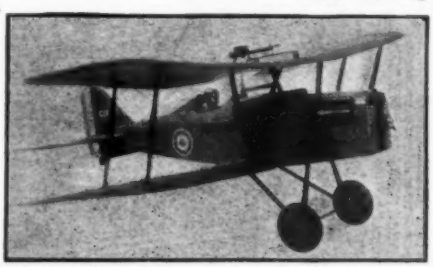
MOST of our readers are well acquainted with Robert R. Sweet, whose drawings have appeared at the head of our Air Ways columns from time to time. His contributions are excellent and we take great pride in claiming him as one of our regular artists. This month he presents a sketch of the latest Waco cabin plane which I believe is the first drawing of this ship to be published, picture No. 1.

R. C. Crum of 5160 Lennox Avenue, Lennox, Calif., brings another unusual feature to our attention. He has just completed and flown successfully, a model of 72-inch wing span. This is what he calls a camera plane, which takes pictures while in flight. Picture No. 2 shows Crum holding this very cleverly built ship with the camera installed in the nose. The ship has made excellent flights. For further details about it, write to this office.

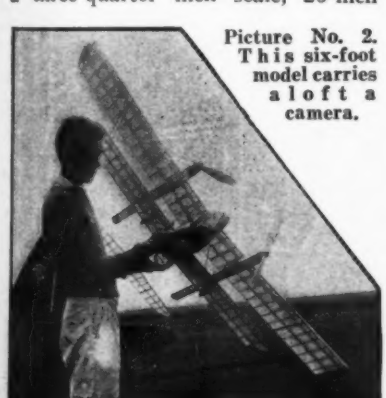
The finest picture that we have received this month is picture No. 3 of a three-quarter inch scale, 20-inch span, S. E. 5 model. This is a beautiful job and J. E. Aiken of 257 La Peer Drive, Beverly Hills, Calif., its builder, may well be proud of it. Good work might be expected of this gentleman however, considering that he has been building models since 1910. This little ship is capable of flights of 15 seconds after rising off the ground under its own power. Another interesting contribution by Mr. Aiken is picture No. 4, a close-up of a Boeing P 12 C model. This is another very unusual picture. You readers who have endeavored to snap photos of your ships, realize that a good "close-up" is very difficult to get. Usually the camera cannot be focused properly to take this type of picture. We would like to call attention to the details of this model. You will note the wires are held in place by miniature fittings and tie-pins. The shape of the propeller is excellent, closely resembling that of a full-sized propeller. Many model propellers are not made accurately and look more like clubs than anything else. Yes, we are pleased to announce that Mr. Aiken has the seat of honor for this month.



Picture No. 5. A well-streamlined speed model built by Elbert J. Weathers. It flies at terrific speed.



Picture No. 3. A twenty-inch flying scale model of an S.E.5, by J. E. Aiken.

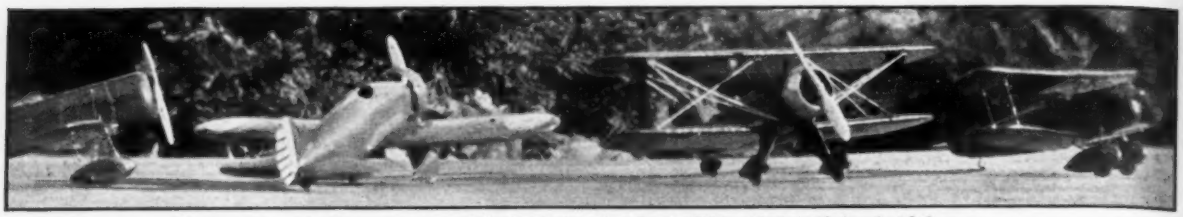


Picture No. 2. This six-foot model carries aloft a camera.

Picture No. 4. This close-up of a model Boeing looks like the real thing. Built by J. E. Aiken.

Mr. Elbert J. Weathers of 2720 Poinsettia Drive, San Diego, Calif., shows promise of being one of our future well-known airplane designers. He has submitted one of the best pictures of a speed ship that we have

Pictures No. 6 and No. 7. These solid scale war-time planes were built by Arnold Smith.



Picture No. 12. Some neat models built by the Bush Hills Model Club of Alabama.

ever received, picture No. 5. Close examination will show that the design of this ship is beautiful in every respect. A great deal of thought has evidently been put into the carefully streamlined construction of the body. In order to give you an idea of the ship, we will quote what he says in his letter:

"The fuselage, fin and rudder are made from the same piece of balsa. In this way, the tail surfaces can be made to mold smoothly into the fuselage. First I cut the balsa block to shape and then proceeded to cut it down the middle with a band-saw. When this was finished, I cemented the two halves together temporarily and proceeded to shape the exterior of it. Finally, I broke the halves apart and gouged out the inside, even way back in the fin, to a thickness of about one-eighth of an inch or less. The rudder was cut out of the same piece and is adjustable. The two shells were then cemented together, forming the finished fuselage. The wing has a span of 19 inches and the fuselage a length of 19½ inches from tip of nose to tip of rudder."

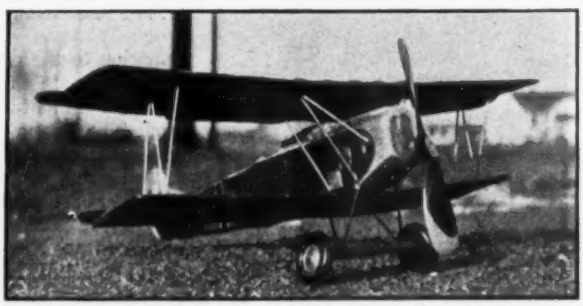
Of any of the ships of original design which have come into this office, this is the finest. What do you think?

Picture No. 8. Harry Edsall and his record-breaking single-propeller pusher.

has ever come to our attention. Evidently Edsall has the knack of building single propeller pushers. This type is unquestionably, in my opinion, the finest type of ship for duration, provided a method is worked out to stiffen the motor stick so that the front plane will not be twisted to one side to a very large extent. This twisting often causes the ship to act very erratically upon being launched. Edsall tells us that the propeller of this ship turns for about 3½ minutes. Upon several flights, it has reached an altitude of 1500 feet. Edsall is very anxious to hear from our readers who wish for first-hand information on endurance planes.

Picture No. 9. A Verville Coach that flies 30 miles per hour. It is over four feet in span. Built by William C. Eymann.

PICTURES No. 6 and No. 7 give a very realistic effect. Judging from the pictures, these ships might be resting on a wartime aviation field ready for business. They were built by Arnold Smith of 2887 Beechwood Blvd., Pittsburgh, Pa. Smith has done extremely fine work as shown particularly by the model machine-gun. In picture No. 6 the machines are a Fokker D.R.1 and a Pfalz D3. In picture No. 7 are shown a Sopwith Camel and a Nieuport.



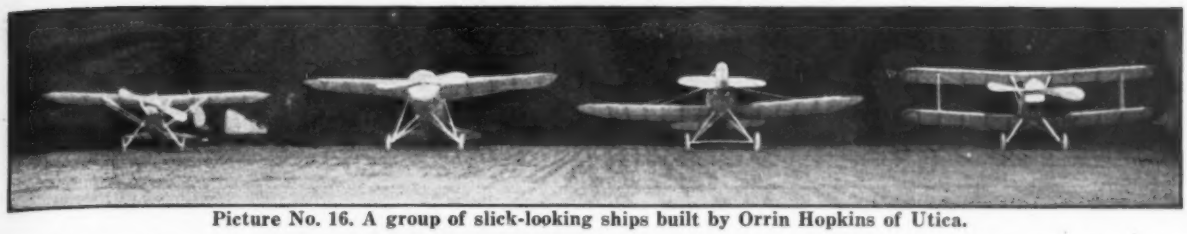
Picture No. 13. A flying scale Fokker D-7 that has been beautifully built by Fareld Line. It flies 200 feet or more.

Harry Edsall of 505 Blaine Avenue, Marion, Ohio, has been knocking down a few records. He is shown in picture No. 8 with his record single propeller pusher. In a contest on June 17th, 1932, Edsall flew this model for 1 hour, 38 minutes and 10 seconds duration. This is the longest time flight that has ever come to our attention. Evidently Edsall has the knack of building single propeller pushers. This type is unquestionably, in my opinion, the finest type of ship for duration, provided a method is worked out to stiffen the motor stick so that the front plane will not be twisted to one side to a very large extent. This twisting often causes the ship to act very erratically upon being launched. Edsall tells us that the propeller of this ship turns for about 3½ minutes. Upon several flights, it has reached an altitude of 1500 feet. Edsall is very anxious to hear from our readers who wish for first-hand information on endurance planes.

Picture No. 10. A rubber powered five-foot model by William C. Morton.

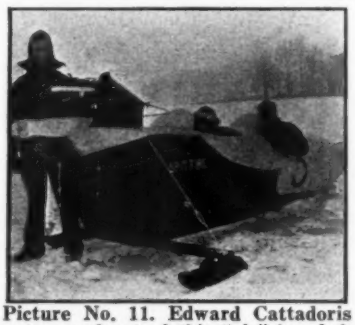
WILLIAM C. EYMANN of 609 Riley Street, Atchison, Kansas, submits picture No. 9. It not only makes an excellent appearance and embodies all details, such as controls, joy sticks, rudder bar, etc., but actually performs in a remarkable fashion. The speed and flight is approximately 30 miles per hour, the duration is 35 seconds and it reaches an altitude of approximately 25 feet. Eymann tells us that after careful measuring, the glide is 14 to 1. Not so bad, is it? The span of this ship is 4 feet, 2 inches; length 2 feet, 6¾ inches; landing gear tread 11 inches; propeller 9½ inches. The plane required one month to build and has been flown repeatedly for thirteen months with hardly any show of wear. It has only two crack-ups to its credit, both of which were minor and were caused by the landing gear lacking sufficient strength. The total weight of the ship is 9 ounces.

Our model builders seem to be going in for larger models these days. Here is another one shown in picture No. 10, built by William C. Morton of Knoxville, Tenn., Route 7. It has a wing spread of 5 feet and is powered by rubber bands instead of a compressed air motor which is generally used in ships of this size. The fuselage is 3 feet long and is covered with tissue paper doped with spar varnish, which when applied, makes the paper practically transparent. Morton says that the model flies very



Picture No. 16. A group of slick-looking ships built by Orrin Hopkins of Utica.

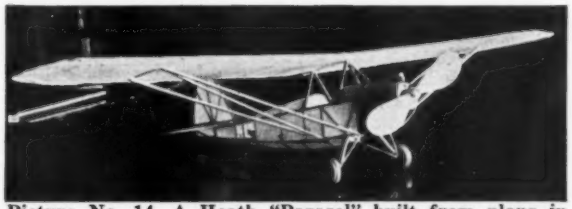
gracefully and nearly always makes a three-point landing. For a young man of fifteen years, he shows great ability.



Picture No. 11. Edward Cattadoris gets speed out of this "air" ice-sled, powered with an airplane motor and propeller.

THREE of our readers, Edward Cattadoris, Albert Cattadoris and George Geary, have wandered, temporarily at least, from the beaten path of model plane building. However, they have applied their aeronautical principles to an ice-boat which they built and which is shown in picture No. 11. The builders are also pictured here, ready for business. Unquestionably these young gentlemen have applied their aeronautical science in a very interesting way and one which affords great sport. They tell us that the ice-sled is of their own design, powered with a Henderson motor. Every Sunday when the ice is good, they try it out on Oneida Lake. It has plenty of speed. Readers may address these young men at 508 Columbia Street, Utica, N. Y.

Picture No. 18. Here is a flying Supermarine built by Ted Skingel, that performs beautifully.



Picture No. 14. A Heath "Parasol" built from plans in "Universal Model Airplane News," by Bob Bimson.

Jack Rutledge of 809 15th Street West, Birmingham, Alabama, sends us picture No. 12, in behalf of the Bush Hills Model Club. This shows some of the most successful planes that were entered in a scale model contest which was recently held by them. Prizes of two airplane rides and a silver loving cup attracted 54 entries. The novel part of the contest was an airplane ride offered for the model with the best working controls, regardless of size or type. In the picture, the ships are left to right, Travel Air S and a Boeing P-26 by Jack Rutledge, a Waco 225 straight wing by Robert Loftus and a Great Lakes Trainer by Walter Schuster. Jack Rutledge won the "working controls" contest with a model of Doolittle's Gee Bee. Another prize winner was a 12-inch Navy Hell Diver by Thomas Pettey. Judges were Lt. Guy McNiel of the 106th Observation Squadron and Mr. S. A. Rutherford.

Here we have some news from three young men who sign themselves "The Three Musketeers." They are Larry Line, Fareld M. Line and Arthur David. They write from Holland, Ohio, near Toledo. They are extremely active and have sent us a group of photographs. However, due to the fact that we must conserve our space, we are only able to print one of them, picture No. 13. This shows a Fokker D-7, built by Fareld Line. I would say that it is a very excellent job. It has a wing span of 22¾ inches and is built exactly to scale. It even has a scale motor and machine-gun. Above all, this ship is an excellent flyer as well. It flies 200 feet consistently.

Bob Bimson of 3221 15th Street C, Moline, Illinois, presents us with picture No. 14, showing his Heath Parasol which was built from the plans published in our December issue. He tells us that this ship makes beautiful flights. This is only one of many models that Bimson has built.

Picture No. 15 shows a Clark Parasol recently built by William Bates Jr., of 518 Moore Street, Beloit, Wisc. This is the first picture we have received of a Clark Parasol that has been built by any of our readers. Plans for this machine appeared in our January issue. This machine is capable of excellent flights. Perhaps Bates will favor us in the future with pictures of this ship in the air (not suspended by wires). Perhaps this is an unnecessary stipulation as we know this to be an excellent flying type.

Picture No. 15. William Bates, Jr., built this Clark "Parasol." Plans appeared in our Jan. issue.

ORRIN HOPKINS of 1319 Miller Street, Utica, New York, presents picture No. 16, showing a group of "crates" that he has built. In using the term "crates," we are merely giving you the term which he applies to them. He evidently does not think much of his handiwork. However, I would say that they aren't a bad-looking set of ships.

Twin pushers seem to be coming into style for I find that many of our readers are building them. Here is one, picture No. 17, held by its builder, Russell Tracy of 343 Harding Court, Pitman, N. J. This is the first twin pusher that he has ever

Picture No. 17. Russell Tracy and his first twin pusher that flies for six minutes.

built, yet it performs beautifully. Judging the design from the pictures, we do not doubt his statement. It has a wing of 27-inch spread, mounted on a 30-inch fuselage. It has made flights of 5 to 6 minutes. On one flight, it landed more than half a mile from its starting point.

One of the best examples of a flying scale model of a Supermarine S 6 B, picture No. 18, has been submitted by Theodore Skingel of 9206 Miles Avenue, Cleveland, Ohio. Skingel tells us that this ship takes off snow and flies in an admirable fashion, at a high rate of speed. He took second place with it in the Pylon Event at the 1932 National Air Race Model Contest. Anyone that can make a model of this ship that will fly well, has my greatest admiration, for it is quite a difficult task.

We hear again from the state of Oregon. Maxwell Roberson of 692 B Street, Ashland, sends us picture No. 19, showing him and one of his friends holding two of his models. Roberson is on the left with a 26-inch flying scale job of a Laird Super-Solution. His friend is exhibiting a Great Lakes Sport Trainer with which he won second place in the scale model flying event held in Grant's Pass, Oregon, last year. Roberson won first place with the Laird Super-Solution. He tells us that this model flies about 375 feet. He gives credit to articles in our magazine for much of his ability, for which we feel he is generous indeed.

Picture No. 19. Maxwell Roberson and a friend. They are model experts.

Picture No. 20 comes from John Silva, Jr., of 741 Davis Street, Santa Rosa, Calif. This shows several of his models. They are, left to right; Sopwith Dolphin, C. I. Pursuit, Nieuport 28, S. E. 5 and a Monocoupe. Silva is a real aviation booster and is doing considerable missionary work by organizing the boys of his community in model flying activities. We hope he keeps up the good work for too much cannot be known concerning science in model building and flying. It offers an invaluable preparation for an active profession in the aviation world.

Picture No. 20. A fleet of models built by John Silva to uphold the prestige of the Pacific Coast.

HERE we have word from Bill Metzger of 1547 Mars Avenue, Lakewood, Ohio. Metzger has been ill in bed for the past three years and he passes the time by making sketches of all types of planes and building models. He has sent us picture No. 21 of a detailed scale flying model of a Sopwith Camel, which he has constructed. He tells us that it has a 20-inch wing span and it is fully detailed. You will notice that there is a dummy pilot in the cockpit. His head moves and he is wearing a tiny pair of goggles. The model is equipped with three machine-guns, two Vickers on the cowling and one Lewis mounted on the upper wing. We hope that some of you fellows will get busy and make Metzger's lagging hours pass more quickly with some interesting letters. I am taking the liberty to send the good wishes of all the readers of UNIVERSAL MODEL AIRPLANE NEWS to this young man. We hope that he will not be confined to his bed much longer. If Mr. Robert Sweet should read this column, will he not write to Metzger, who makes a special request that we have him do so.

Picture No. 21. Bill Metzger bends this Sopwith Camel. Even the pilot has miniature goggles.

Picture No. 24. Geo. W. Diefenderfer of the Fullerton Model Club and his Wind Buggy.

Mr. Harland C. Wood of Lyndonville, Vt., favors us with a very excellent drawing of the Boeing P12E, picture (below). We have received a great many drawings from the readers of the magazine who apparently are going into the artistic field and we regret that our space limits the publication of these to one or two a month.

Several items of great interest come to our attention this month. Gerald D. Cord, Box 420, San Antonio, Texas, has made a collection of very rare air-

(Continued on page 36)

Picture No. 23. Three winners of the Milwaukee, Wisc., Model Airplane Club speed contest. They are left to right, Herbert Markwiess, Orville Goedon and Gordon Zimmerman.

Foreign Model Plane Activities

Picture No. 6. The Model Club of Orange, New South Wales, in action.

MODEL flying seems to be a very popular pastime in Australia, if we are to judge from the pictures we have just received from Mr. Ivor Freshman, general secretary of the Model Flying Club of Australia. Of course when we stop to think about it, we realize that Australia is now passing through its summer months as it is located in the southern hemisphere. Thus, they unquestionably have finer flying weather for outdoor contests than we are enjoying at the present time.

Picture No. 2. An Avro "Ten," built by Jack Newton and A. Noble.

Two pictures which deserve attention are picture No. 1 of a Wafifi two seater fighter and reconnaissance biplane and picture No. 2, an Avro Ten. Both these ships are solid scale models built by Jack Newton and A. Noble. The Wafifi biplane, as you will see upon close inspection, has been built with careful detail. It has movable controls, miniature machine-gun and all the other features.

The Avro Ten is not on a runway of a sea airport as it appears to be from the picture. One can readily imagine, if this ship had pontoons, that it had just been pulled up out of the water. Close examination will show tall, swale grass on either side of the runway and a rippled sheet of water stretching out to the horizon line, under a cloudy gray sky. The few streaks of light on the left give the impression of a moon breaking through the clouds and reflecting itself upon the water's rippled surface.

However, this is only a phantasy. Actually the background is nothing but a board fence which shows the grain of the wood plainly, the horizon line being a crack between two of the boards. One would say this is rather a let-down from the sublime to the ridiculous.

The large model craze has evidently struck our distant brothers in Australia for picture No. 3 shows Mr. Freshman launching a stick tractor of 6′ 6″ span. The fuselage is built up of 1/16-inch sheet balsa. Believe it or not, the propeller is 36 inches in diameter. This machine flies from 70 to 90 seconds without the aid of up-drafts.

Picture No. 3. Mr. Freshman launches 6½-footer.

In picture No. 4, we see the Lithgow branch of the Model Flying Club of Australia. We cannot help but marvel at the growing interest in this great sport of model building and flying in far off Australia, when we see this picture.

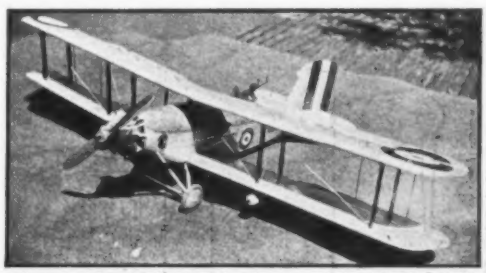
New Zealand seems to have caught the fever also, for picture No. 5 shows several young men of that country launching their planes into flight.

MEMBERS of the Orange Club of New South Wales, not to be outdone by other Australian units, have sent us picture No. 6 through Mr. Freshman. It is no wonder that the young men of Australia and New Zealand are showing a keen interest in model plane building, for the future of these countries with their enormous expanse of vastly populated country will depend very largely on air trans-

(*Continued on page 37*)

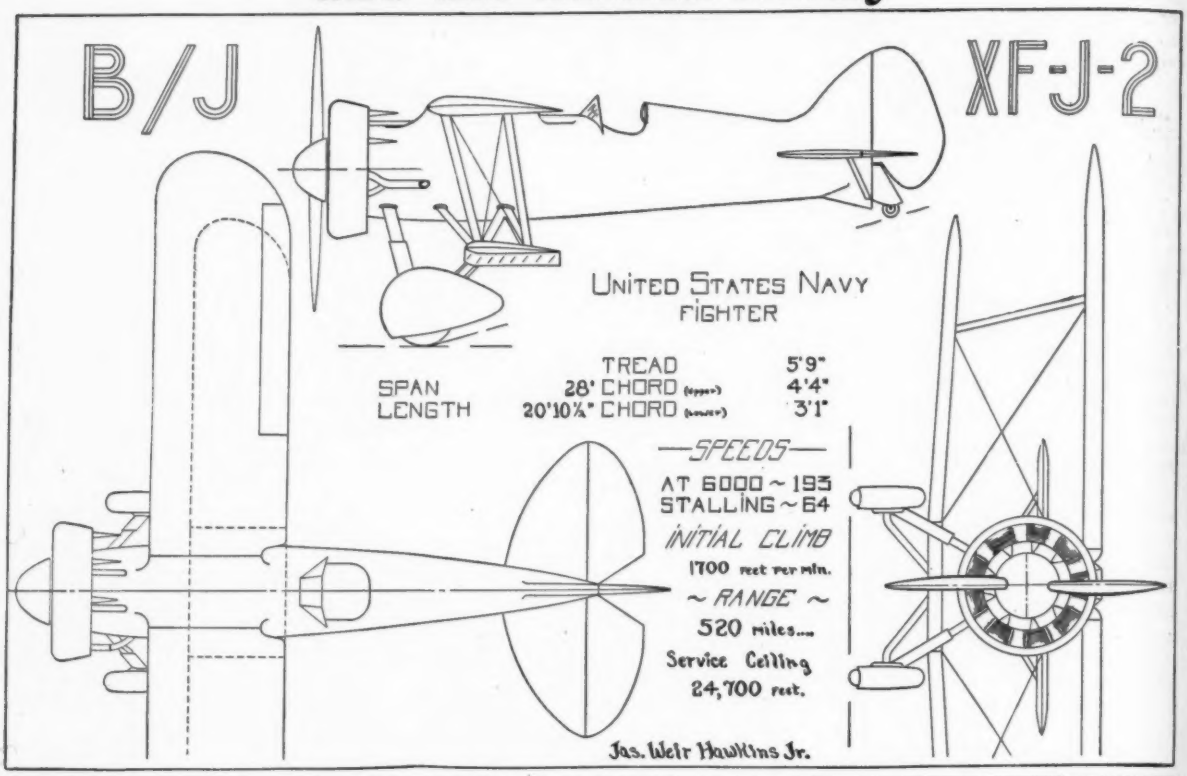
Picture No. 4. The Lithgow branch shows plenty of activity. Just a few of its members.

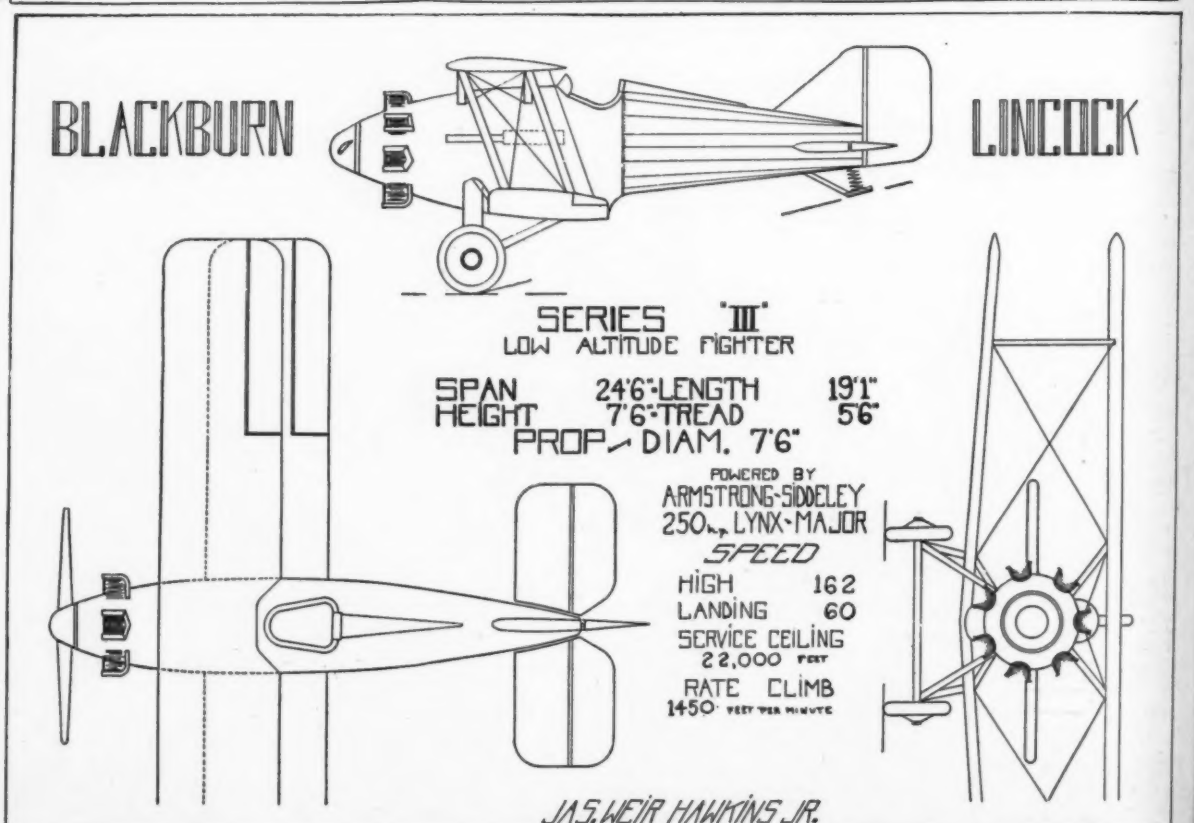
Picture No. 5. New Zealand boys are up to the minute in aviation.



Picture No. 1. Jack Newton and A. Noble built this "Wafifi." It is a beautiful job. Yes?

Modern Fighters of the U. S. Navy and the British Army





The Aerodynamic Design of the Model Plane

Forces Developed in Airplanes that Tend to Produce Longitudinal Instability and How You Can Minimize Their Action

By Charles Hampson Grant

ARTICLE No. 15 CHAPTER III

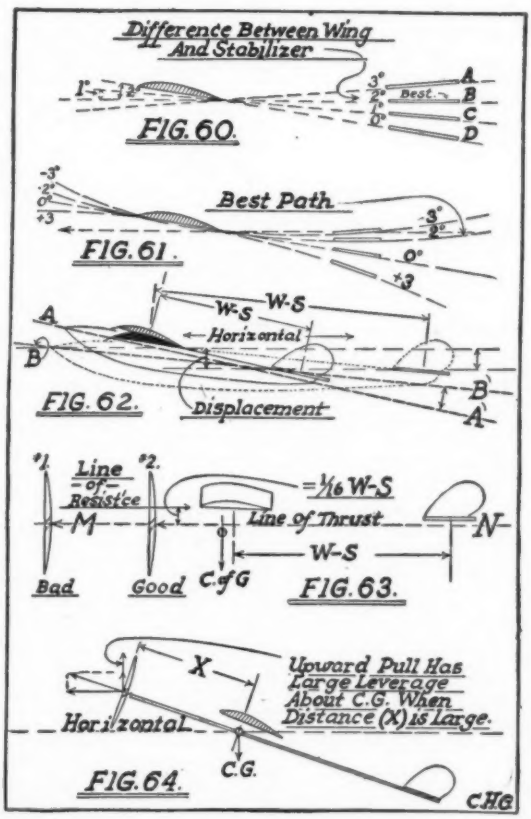
It would be greatly appreciated if our readers would write and tell us whether or not they would care to see this series of articles printed in book form. (Editor).

IN the last installment of this series of articles, it was necessary to break off our discussion of longitudinal stability rather abruptly. We were considering the factors of design that had a bearing upon the displacement of the airplane longitudinally, from its normal flight position. Two of them have been given consideration. They are, (1), the position of the center of gravity relative to the center of pressure taken in a horizontal plane and (2), the type of wing section or airfoil used.

Now, let us continue by considering the third factor; ie., (3), the size of the WING CHORD. In the discussion of factor No. 2, it was shown that the center of pressure (Lift) moved forward and backward in such a way when the angle of attack of the wing changed, as to cause a cambered wing to be unstable. On any given airfoil section, this movement amounts to a definite percentage of the chord of the airfoil. Usually the center of pressure moves from a point at 60% of the chord from the leading edge of the wing, at (-2°) angle of attack, to a point 30% of the chord from the leading edge, at 14° angle of attack. This movement represents a movement of 30% of the chord; that is, nearly one-third of the chord. If our wing has a chord of 3⅛", the center of pressure position will vary about one inch, backward and forward. *Now, here is the important point* in the matter. If the wing chord is doubled to 6¼", the center of pressure movement will be (2) inches or twice as much. Thus it will have twice as much disturbing effect so far as the longitudinal stability of the airplane is concerned.

It is obvious, therefore, that the smaller you make the chord of the wing on your airplane, the more stable it will be longitudinally. A convenient rule to follow is:—*never make the average wing chord greater than* 1/6 *the span of the wing.* Another rule that may help you is:—*never make the average wing chord greater than 1/3 of the distance between the center of the wing and the center of the stabilizer.* This latter rule is a very good one to follow. However, usually we select a chord length before the distance of the stabilizer from the wing has been determined. So it might better be said that the distance from the center of the wing to the center of the stabilizer should be equal to at least three times the average wing chord.

Now we come to factor No. 4; the difference in angle between the horizontal stabilizer and the wing or wings. (The stabilizer on a model herein, is taken always to mean the total horizontal tail surface).



IN previous pages you may remember that it has been said that it is customary and advisable to place the wing on the airplane at an angle of incidence of (2) or (3) degrees positive. If the stabilizer is so placed on the plane that it is at a *greater* lifting angle of incidence than the wing or wings, the tail will lift and nose the model over into a dive. On the other hand, if the stabilizer is set at an angle of incidence less than that of the wing, it will nose the model up, or keep it in proper flight position, depending upon the model's balance and speed. The larger this difference in angle between the wing and the stabilizer, the greater the nosing up effect will be, at any given speed. In fact, it may be great enough to cause the machine to stall. This happens in many cases and is decidedly undesirable when it causes this maneuver. It is advisable, therefore, to *have as little difference in angle between the wing and the stabilizer* as possible. *Usually the stabilizer should be set at about (2) degrees less angle of incidence than the wing or wngs,* Fig. No. 60. In many cases, models have flown well when the stabilizer has been set at an angle of incidence of (1) degree *less than the wing.*

When considering the setting of the stabilizer on any model, we must also consider disturbing factor No. 5, the speed of the model, for it is because of the difference in angle between the wing and stabilizer that the factor of speed has a disturbing effect.

The faster a model travels, the greater is the effect of this difference in angle. It can be seen, therefore, that on fast models the difference in angle between wing and stabilizer should be as small as possible. Obviously, on the other hand, the slower you can make your model fly, the less disturbing effect this difference will have.

Fig. No. 61 shows the paths a model will have a tendency to follow with various stabilizer settings, when it has considerable speed. The steep curve (A), is the course produced by a large difference *(Continued on page* 44)

The Early Spanish Galleon
Length 6 in. Overall

The Mayflower
Length 6 in. Overall

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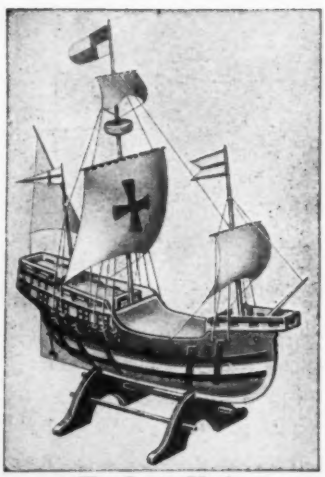

The Santa Maria
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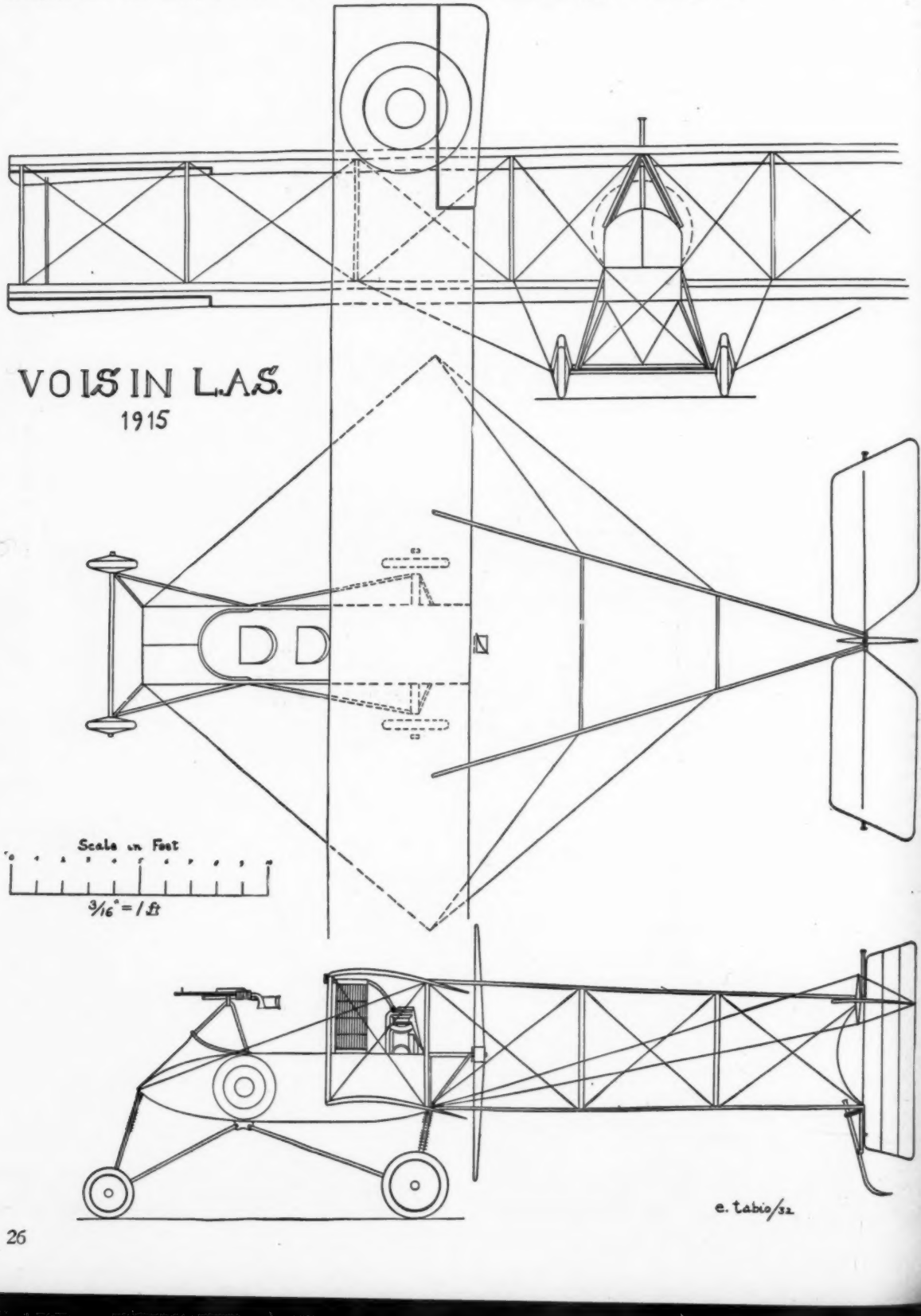
The Voisin L. A. S. Observation

THIS machine served the French well throughout the whole war, from 1914 to 1918. It was used for observation and light bombing operations because of its steadiness in flight. The pilot occupied the rear cockpit, and the observer the front one. This plane was equipped with a water-cooled radial "Canton Unné" or a "Salmson," of 150 horsepower. The color scheme is all gray or light orange. For a flying model, give wings a dihedral of 6 or 8 degrees on each side.



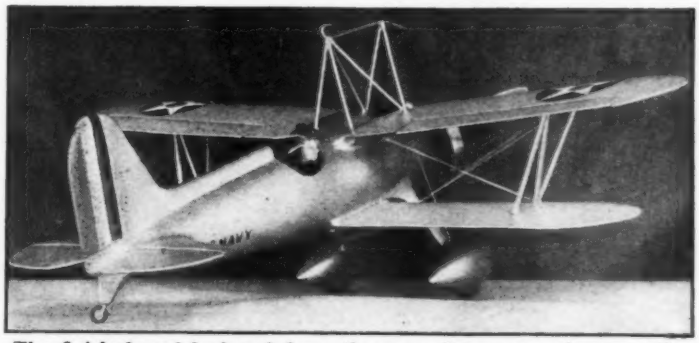
A Miniature F.9 C.2 Fighter

Here are Instructions and Plans to Build an Exact Detail Scale Model of One of the U. S. Navy's Greatest Planes

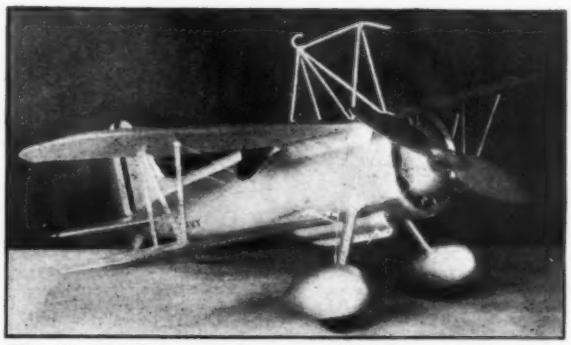
By Joseph Battaglia

HERE is something that most of you detail scale model builders have wanted to build ever since the real ship first made its appearance in aviation circles—namely, an accurate, authentic, detail scale Curtiss F.9 C.2, Sparrow Hawk, which is popularly known as the Akron Fighter.

These plans have been scaled down directly from the Curtiss factory drawings and the Navy Curtiss F.9 C.2 handbook. All possible details are in the plans set before you and, if any of you feel that the dimensions on the drawings are not close enough, kindly send me a self-addressed, stamped envelope and I will be glad to send you the decimal equivalents to each dimension given herein.



The finished model viewed from the rear shows grace in every line. It is built exactly like the full scale ship.



The "hook-on" gear is the unusual feature of this plane. Here it is clearly shown.

Fuselage

There is plenty of work here, so buckle down and pay strict attention to the drawings. Let us presume that the whole model is to be made of metal, just like the large ship. On the large machine, the bulkheads of the fuselage are made of sheet metal, as shown by the cross section in the diagram. In the model, they can be made of 3/32" square metal or balsa.

When all the bulkheads are made, they are placed in a jig or held on a board by means of nails, placed on either side of them. Then the covering of (.007) seven-thousandths gauge sheet metal is soldered in place in narrow strips. Be sure to solder all joints carefully. When this operation is completed, smooth off with fine emery paper and put on model pin heads to give the effect of rivet heads, as shown on side view of fuselage. (Balsa sheet should be used if the bulkheads are made of balsa.)

On bulkhead No. 2, at the sides and ⅝" up from the bottom by rule measurement, solder, rivet, or cement if made of wood, a small terminal to accommodate the main landing gear strut.

Now make the strut of ¼" diameter tubing with a 5/32" hole as shown and bend (.006) six thousandths gauge sheet metal around both sides, forming the streamline shape.

When these have been lined up, take two sheets of (.007) seven-thousandths gauge sheet metal and cut them slightly larger than the wheel pants pattern. Each of these form one-half of a pant. Now hammer them into shape of a half-pant. After this is done, cut away a piece of the outside of one half-pant in each pair, the shape of the wheel, then solder both halves together.

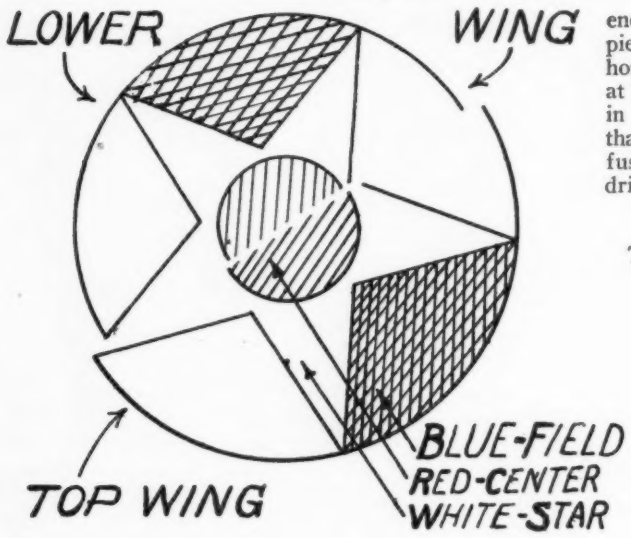
Next, fasten the struts firmly onto each pant, allowing the tubing to continue down into the pant, equal distances on each side of the landing gear. Make the yoke, which holds the wheel in place, of 1/16" tubing or rod and insert into the pant, then solder the ¼" strut tubing onto the yoke. Make the center axles, which lead from the inner side of pants to center of fuselage and are in line with the main struts. Connect them by means of fittings on the bottom of bulkhead No. 2 and on the end of struts.

SOLDER the rear struts onto the main struts and use fittings on the fuselage end of each. Assemble the under-carriage, seeing that everything is lined up and then start on the wheels.

Spin the wheels on a lathe, either all in one piece or just the wheel drum, attaching the rubber tires later. Drill a 5/32" hole in each drum center (running fit). Fit a 5/32" tube in the wheel and rivet over the two ends, pulling the two disks tight. Next, make a piano wire coil spring the diameter of the wheel axle and slip it up into the strut tube. Now, you've got a shock absorber. Work it in well so that it will "give" under slight pressure.

Next we have the tail wheel assembly. Spin out the wheel on a lathe, drill a 3/64" hole through the center and lay aside. Cut down a ⅛" tube and drill a 3/64" hole at one end, then cut the tube through the center and spread apart to allow for the wheel to fit. Cut this part, called the "fork," about 5/16" long and bend it on the angle as shown. Now cut a ¼" diameter tube 11/16" long and solder a piece of sheet metal, (.0010) gauge, ½" diameter on one end. Insert a spring into this tube and place a metal washer with a ⅛" hole on the end through which the spring was placed. Solder this washer firmly in place, then fit the tubing, holding the wheel into the tube on which the washer is soldered. The diagram shows the shock absorber in compression.

Fit the top end of the shock absorber against the tail



end of the fuselage and solder on firmly. Now cut two pieces of (.007) gauge sheet metal for the streamline housing. Place them around the absorber tube and solder at both ends and at top, against fuselage. Place the wheel in the "fork" and drive a small pin through it, finishing that. If the faring is made of balsa, cement it to the fuselage and fit the shock absorber tube into a hole drilled in the faring.

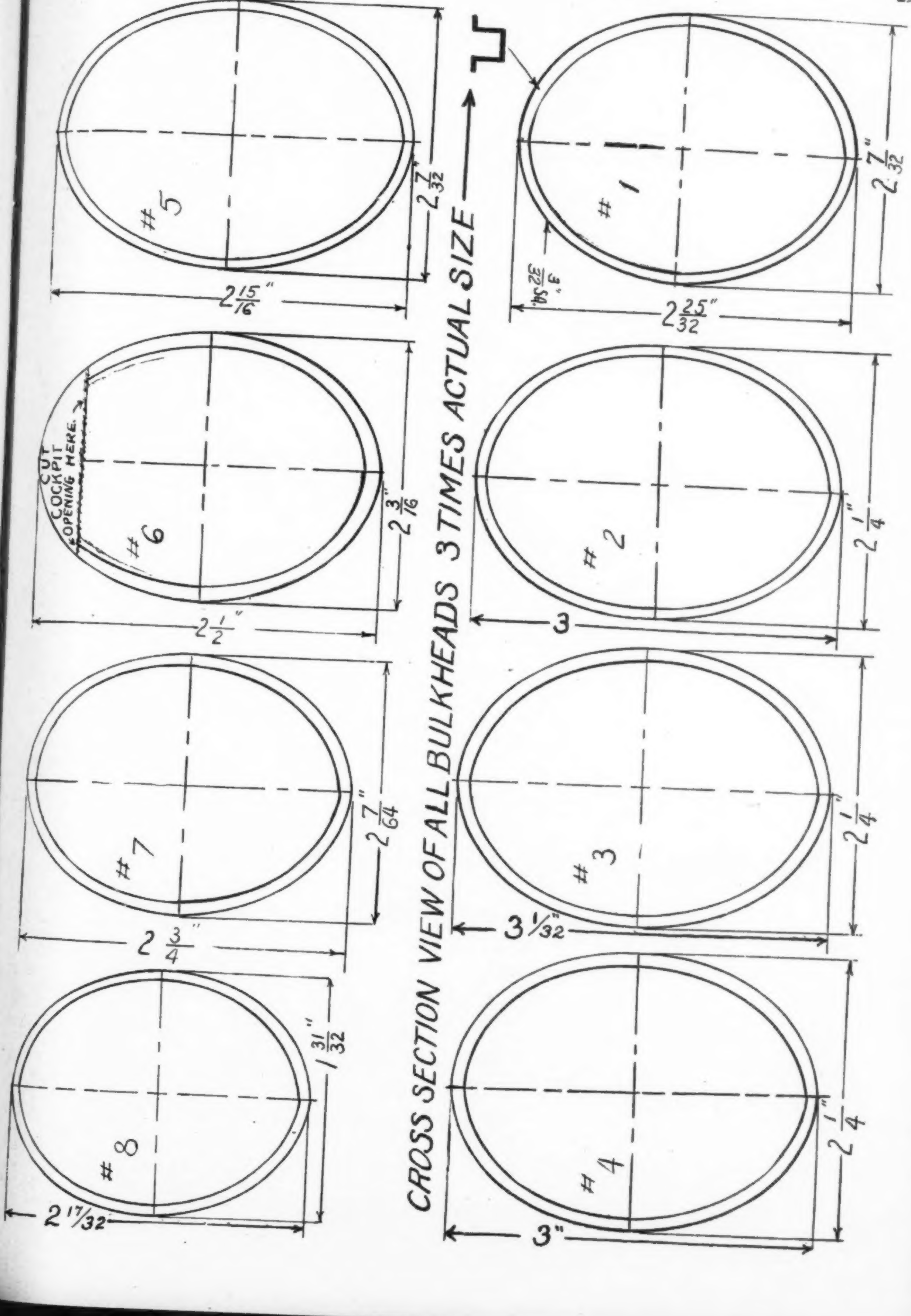
Controls

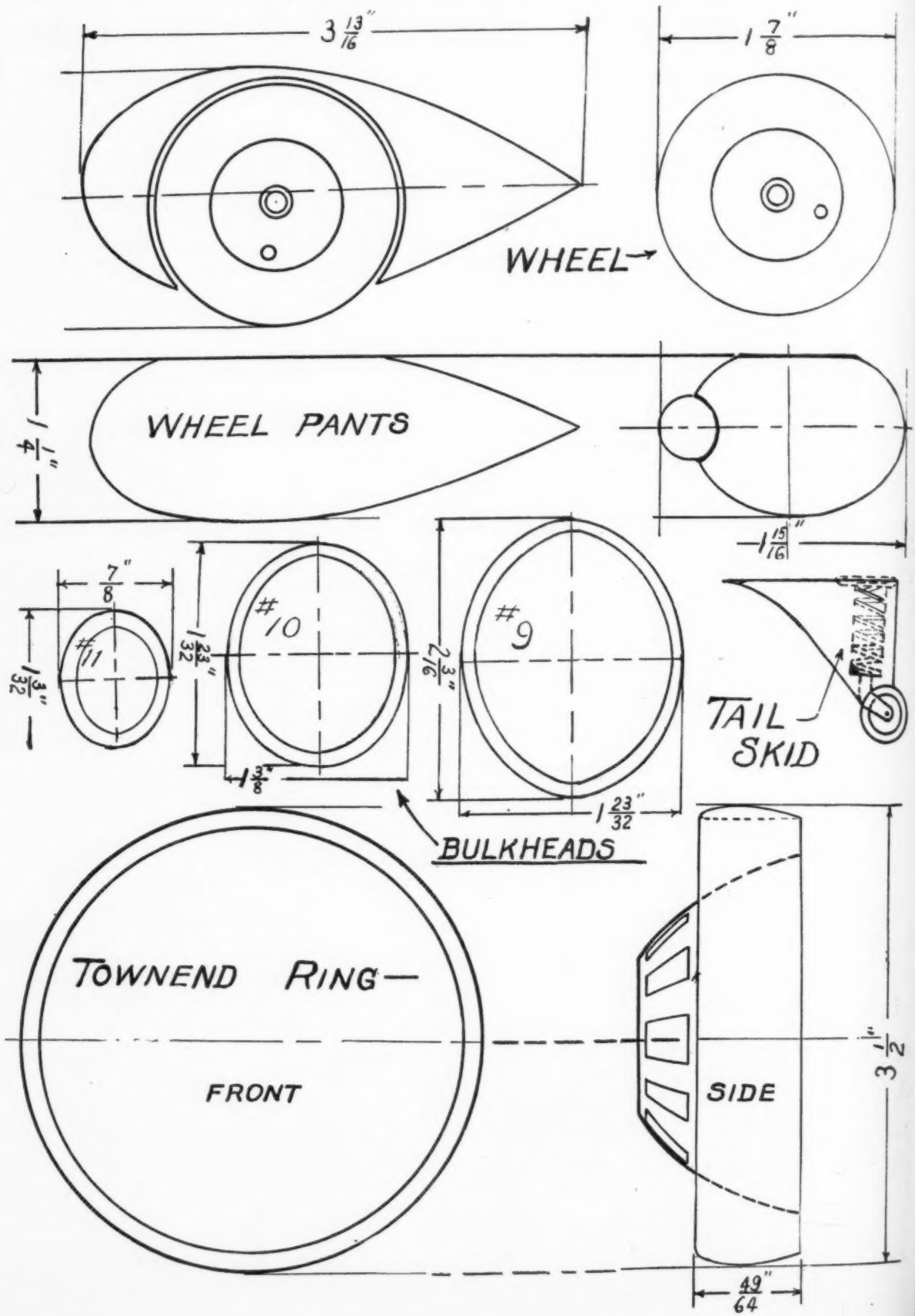
The controls come next. Special care must be exercised in making these. The perspective view of the cockpit, controls and instruments are up to scale, but the shapes and position of each part are quite correct.

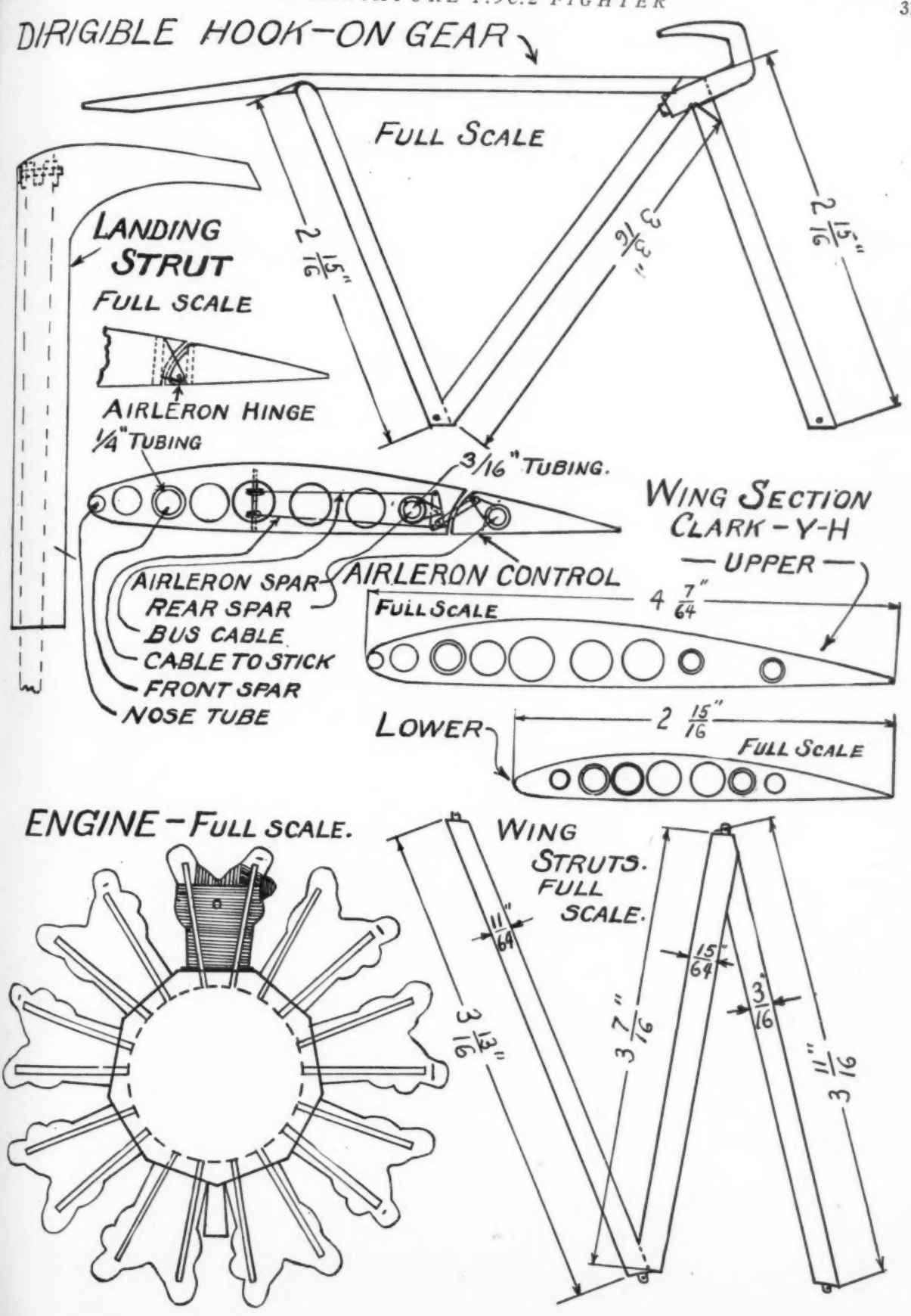
The rudder comes next. Each rib is shown in the drawing. Take two pieces of (.007) gauge sheet metal and cut them the size and shape of the rudder. Then cut all the ribs from 3/64" sheet metal and drill the holes for the spars and cross-bracings. Cut the spars down to proper length (these being 3/32" tubing and the cross members of 3/64" tubing), and assemble all the parts, soldering each joint firmly. Bend 1/32" round rod around the edges and solder to each rib end.

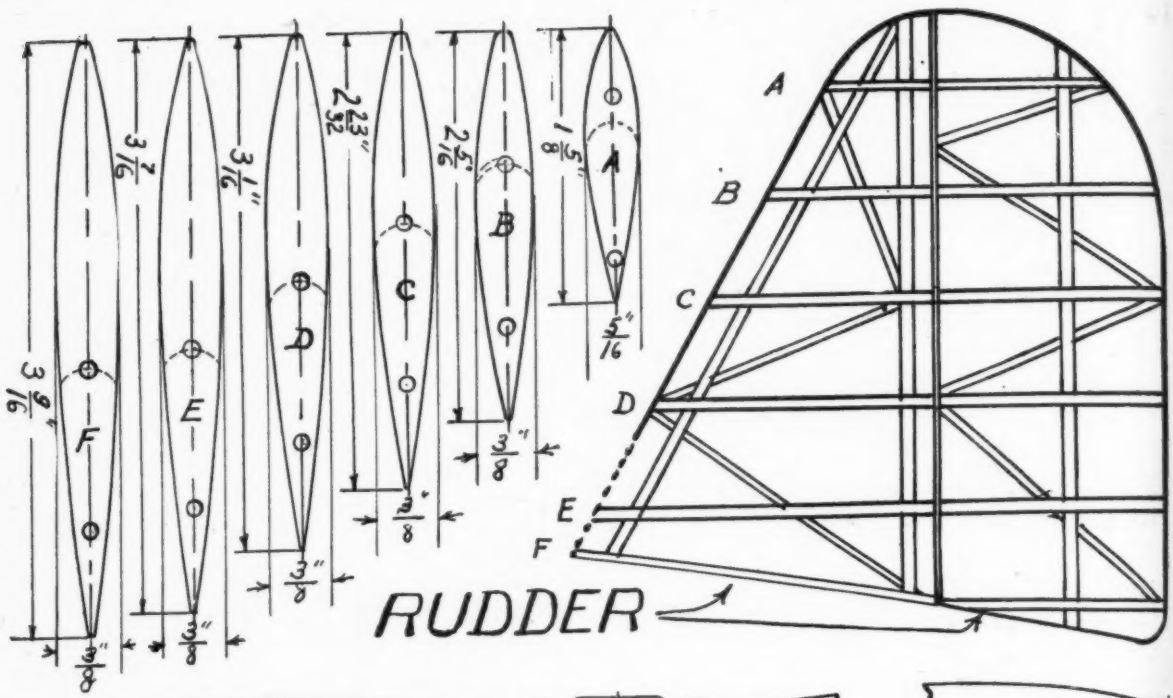
Lay the sheet metal covering on top of the framework and solder it on around the edges and you will have a strong, perfect model empennage surface. Repeat this operation for all

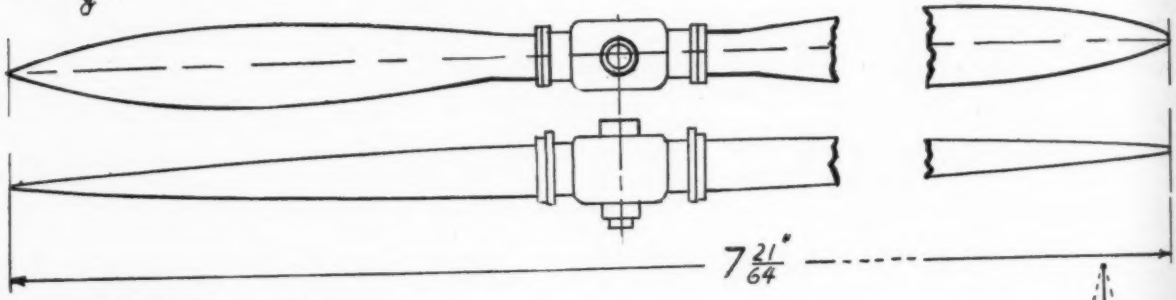
(Continued on page 38)


CROSS SECTION VIEW OF ALL BULKHEADS 3 TIMES ACTUAL SIZE
#1
2 7/32"
2 25/32"
3/64"
#2
2 1/4"
3
#3
2 1/4"
3 1/32"
#4
2 1/4"
3"
#5
2 7/32
2 15/16"
#6
CUT COCKPIT OPENING HERE.
2 3/16
2 1/2"
#7
2 7/64"
2 3/4"
#8
1 31/32"
2 17/32

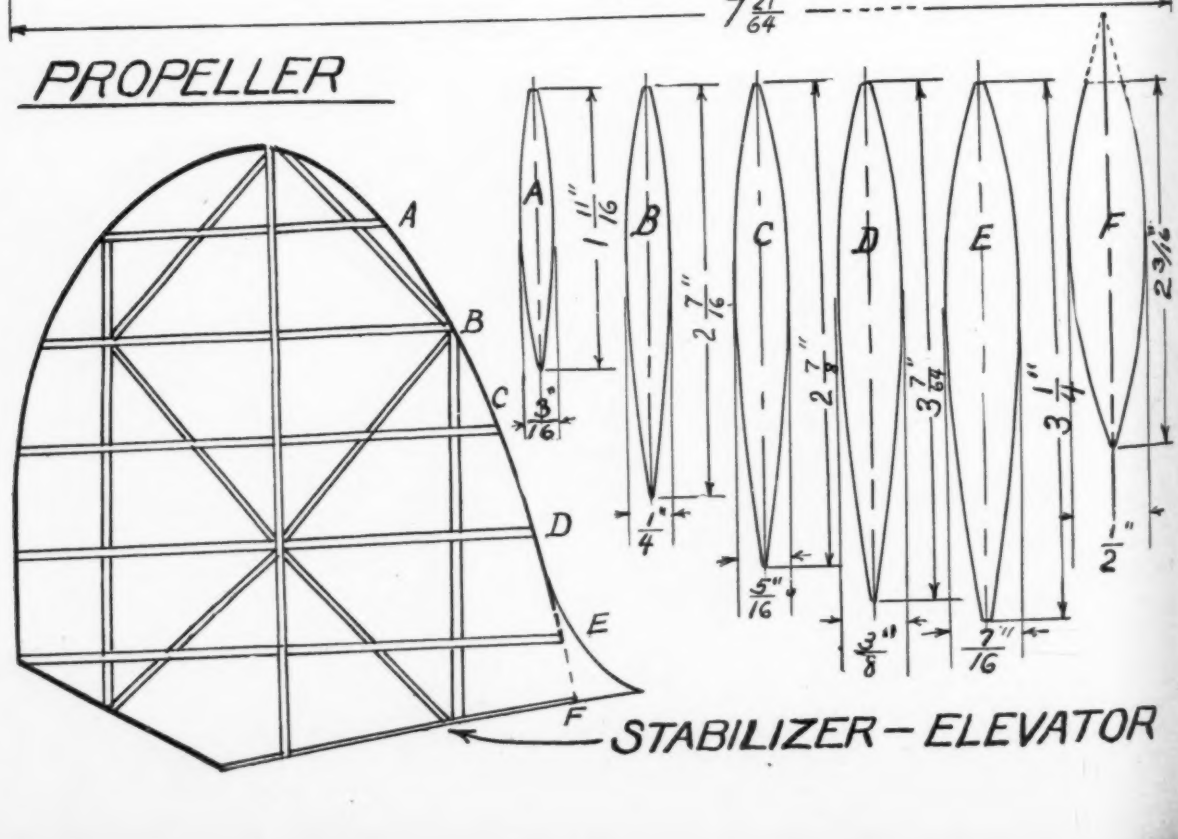

3 13/16"
1 7/8"
WHEEL
1 1/4"
WHEEL PANTS
1 15/16"
7/8"
#11
1 3/32"
#10
1 23/32"
1 3/8"
#9
2 3/16"
1 23/32"
TAIL SKID
BULKHEADS
TOWNEND RING
FRONT
SIDE
3 1/2"
49/64"


DIRIGIBLE HOOK-ON GEAR
FULL SCALE
2 15/16"
3 3/16"
2 15/16"
LANDING STRUT
FULL SCALE
AIRLERON HINGE
1/4" TUBING
3/16" TUBING.
AIRLERON SPAR
REAR SPAR
BUS CABLE
CABLE TO STICK
FRONT SPAR
NOSE TUBE
AIRLERON CONTROL
WING SECTION
CLARK-Y-H
UPPER
4 7/64"
FULL SCALE
LOWER
2 15/16"
FULL SCALE
ENGINE - FULL SCALE.
WING STRUTS. FULL SCALE.
11/64"
3 13/16"
15/64"
3 7/16"
3/16"
3 11/16"





PROPELLER



"Whats" and "What Nots" of Model Plane Building

Simple and Effective Methods That Will Help You to Cover and Decorate Your Model Accurately

By Howard G. McEntee

PART IV, *Continued*

LAST month, practical methods of covering your model with paper, were given to you. Here is another type of covering that will prove much more durable and very little heavier if you obtain the proper grade of material.

Silk Covering

Silk is much easier to cover with than paper because it is so flexible and it may be fitted over different curves without cutting or piecing. Unlike paper, though, it must be pulled out carefully before the glue dries, so that it does not sag. On a wing it may be put on just like paper, pulling tightly lengthwise and only moderately across the wing. The same holds true in fuselage covering. Always apply it with the threads running lengthwise and crosswise of the frame, never on the bias.

Tightening Covering

For tightening up paper *always* use plain water first, followed later by paint or dope if you desire a finished surface. To apply this, if possible, use some sort of spray rather than try to brush it on. Ordinary atomizers are satisfactory for the purpose. Some perfumes come in spray bottles which, when cleaned out, are just the thing. If you have a good pair of lungs, Fig. 2 shows how a simple spray can be made. It consists merely of two tubes fastened together at a certain angle, which must be found by experiment. They may be soldered, held in a piece of wood or in any convenient manner. The blow tube is usually a bit larger than the other. If possible make it 1/8" diameter and the other tube 3/32". The blow tube may be any convenient length, the other being long enough to reach into the water.

FIG. 1.

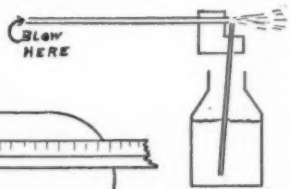


FIG. 2.

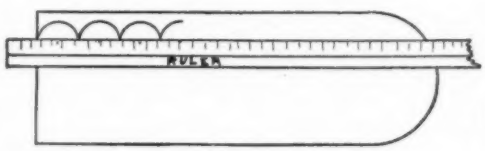


FIG. 3.

THE water must be sprayed fairly evenly and care taken not to get a lot in one spot and little or none in another. The proper amount will be found by experiment, but you must never soak the paper, or put on so much the drops can be shaken off. While the paper is wet it is very soft so do not touch or poke it for any purpose whatever or that section will need replacement.

When a wing has been sprayed and is partially dry it should be supported on a flat board with two narrow strips running parallel and under the extreme inner and outer ribs. On the top of these same ribs carefully place small weights to hold the wing in place and prevent warping when the paper pulls up. The raising strips allow the air to circulate under the wing and so hurry the evaporation of the water. If you desire, the wing, supported as described, may be placed in a warm, not hot, place. This has a slight tendency to cause warping, however, so if the framework is at all fragile, let it alone to take its time.

As the fuselage is usually strong enough so that no weights or bracing are necessary, just hang it up in a warm place.

If, when all the paper has dried, you find some wrinkles left, they may often be removed by repeated spraying and drying.

All the directions and suggestions given here for paper apply equally well to silk covering, which tightens up beautifully when sprayed with water. Where paper may be left as it is after tightening, if no other finish is desired, silk must have some material applied to fill up the pores and make it airtight. After trying dozens of different finishing combinations while building the five-footer mentioned before, the following was decided upon as best. After tightening with water, carefully brush on a coat of clear banana oil. This must be done very carefully as the oil tends to soak through and collect on the bottom of the surface being coated. For this reason, you cannot slop it on and then spread it with the brush, but rather you must apply it sparingly and brush well to fill the spaces between the silk threads. For the finishing coat, the quick drying lacquer is preferable, and may be thinned slightly if desirable. Regular airplane dope is unsuitable as it dries too quickly. Of course, if you have facilities to spray it on, it is perfectly satisfactory, otherwise leave it alone.

As a finishing touch you may carefully rub on some fine car or furniture wax, polishing it off nicely with a soft cloth. This finish, in addition to the beautiful appearance, sheds water like the proverbial duck's back, so it is perfect for large seaplane models.

Getting back to paper coverings, the reliable banana oil is the best light-weight finishing material. It should be brushed on lightly with a camel's hair brush and, contrary to some builders' opinions, has not the slightest tendency to loosen the paper previously glued with it. The new enamel dopes give a fine finish but usually two coats are required, especially when finishing white paper in some dark color. The quick drying lacquers may also be used, and while they are heavier, one coat usually suffices for the proper shade so the weight comes out about equal.

We now take up various short cuts and methods for decorating models with stripes, insignia, numerals and the like.

Usually it is best to buy insignia and glue them in place. Quite often, though, the proper size cannot be obtained and the work must be done with paint. Using a compass, protractor and ruler, lay the work out in pencil, then fill in with paint. If you wish *(Continued on page 42)*

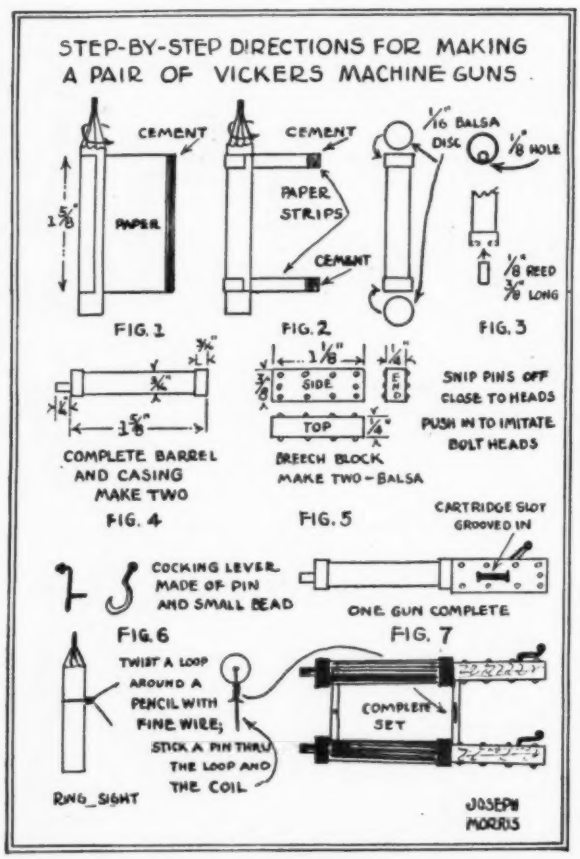
Machine Guns for Your Scale Model

Dress Up That "Camel" or Nieuport Model with Accurately Designed Featherweight Miniature Machine Guns

By Joseph F. Morris

MANY readers of UNIVERSAL MODEL AIRPLANE NEWS are builders of wartime models. Plans for these are not hard to get, especially since U.M.A.N. has been publishing good three-view layouts of Allied and German combat ships. But when he tries to find plans of machine guns, the builder is not so fortunate. He can, of course, buy dummy guns from the model houses, but they are either cast in type metal and are therefore too heavy or are such sketchy copies of the originals that they hardly look like the guns they are supposed to represent. Nothing adds quite so much to the appearance of a model fighting ship as businesslike guns and it is the purpose of this article to give detailed instructions on the making of a set of Vickers cowl guns of the twin synchronized type.

For the Vickers guns, suitable for a fifteen or a twenty inch model, we will need only a piece of fairly heavy paper, two pencils, some small balsa blocks, twenty or thirty common pins, an inch of 1/8" reed and two small black beads. This type of gun consists of a barrel, a cooling casing, a breech block, a cocking lever, and supports to hold the gun in the proper position. Make a tube of a piece of paper 1⅝" wide and long enough to make two turns around an ordinary round lead pencil. Put some aeroplane cement on the edge of this, as shown in Figure 1, roll it around the pencil and make a tube of it. Lay the tube, still on the pencil, aside to dry. Make two of these tubes. Cut some paper strips 3/16" wide and 3" long. Cover one side of these with cement and wind them around the ends of the long tubes as shown in Figure 2. This makes a raised ferrule on the end of each tube. When all this is dry, remove the pencils from the tubes. Take a piece of 1/16" balsa (medium) and cut four small discs just large enough to fit snugly into the ends of the tubes. Put cement on the inside edges of the tubes, press the tubes down over the discs as they lay on a flat surface, and let them dry. Cut off two pieces of 1/8" reed, each 3/8" long, for the protruding muzzles. With a twist drill, carefully drill a hole in the end of each tube (that is, in the disc in the end of the tube). Put cement into this hole and put the reed in place, leaving 1/4" sticking out for a muzzle. This completes the barrel and casing. (See Figure 4.)



MAKE two blocks of the dimensions shown in Figure 5. Snip ordinary pins off close to the heads, dip them in cement, and stick them into the blocks to imitate bolt-heads. As shown in Figure 5, there are ten on each side of the breech block.

For your cocking lever, take a pin, run a medium sized black bead up to the head, and bend over the shank at right angles, so that the bead forms a handle-knob. Then bend the rest of the pin shank into the shape shown in Figure 6. Put cement onto the pin point and put it into the breech block as shown in Figure 7.

For the ring sight, take some soft, fine wire—a single strand from a piece of braided picture-wire will do—about two inches long, and twist it around a pencil as shown, to form a round loop. Make your spiral loose enough to allow a pin to be pushed through it, as shown in Figure 8. Touch the coil and pin with a drop of cement.

The supports for the assembly are of 1/8" soft balsa, curved on the underside to fit the cowl the guns are intended for. Note that the forward support is shorter than the rear one, making the guns toe in so that their fire will converge. The ring sight is stuck into the rear support with cement, and then a common pin is cemented into the front bar, in the center, to make the front sight.

Your gun is now ready for painting, and may be finished in any one of a number of ways. One scheme is to paint the muzzle and cross-bars black, the barrel, tube and breech-block silver. *Don't* use lacquer, for the banana oil in it will loosen up your cement and make a messy job. Use a little lampblack and turpentine. This does not affect the cement, and when wiped off with a dab of cotton leaves the bolt-heads and cocking lever shiny. If you use aluminum powder, mix it with varnish instead of banana oil, and use it creamy and thick. Another method is to use equal parts of lampblack and Prussian blue oil color ground in turpentine for finishing the entire gun. This leaves the bolt-heads shiny and the rest blued steel. Or the whole gun can be painted silver, or the barrel and tube can be silvered and the breech-block painted black.

THIS makes a set of machine-guns suitable for a fifteen inch model. For a thirty or a thirty-six inch model, use a piece of round *(Continued on page 38)*

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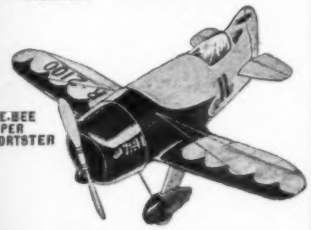

GEE-BEE SUPER SPORTSTER

95¢ each *Postage 15c West of Miss. 25c*

Plans alone 25c each

ALL 18" WING SPAN

CURTISS A-8 ATTACK

BOEING

READ THIS FOR YOUR PROTECTION!

Every SELLEY product is guaranteed to be the best obtainable and is manufactured in the largest and most modern model factory in the world. You may safely choose any construction set or accessory and if it does not meet with your entire satisfaction your money will be immediately refunded!

SELLEY ALONE CAN MAKE THIS BROAD GUARANTEE!

Each kit is packed complete in a strong, attractively colored and labeled box with printed balsa sheet, balsa sticks, special turned wheels, rubber, cement, two colors Jap tissue, music wire, bamboo and reed with complete easy to follow building instructions and large, full-size 12 x 18 plan.

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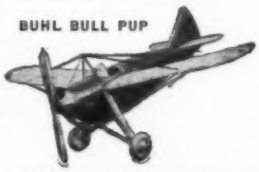

FAIRCHILD

AERONCA

ALL 14" WING SPAN

25¢ EACH

Postage 10c for every two kits West of Miss. 15c

Plans alone 10c

Talk about flying! These 14" flying models assure amazing performance. Experiment in our factory has proven that these planes fly with extraordinary ease and speed. Try them and convince yourself!

VERVILLE AIR COACH

This offer is so remarkable that many will not believe until they actually build and fly these new, sensationally priced SELLEY construction sets. Beware of inferior kits! Words alone never assure quality! These kits are accurately designed, realistic flying scale models embracing the same quality that thousands of boys enjoyed in SELLEY'S much higher priced kits. Remember this! NOTHING IS CHANGED BUT THE PRICE, AND THE PRICE IS THE LOWEST IN OUR HISTORY! Large scale production makes these extraordinary bargains possible without sacrificing SELLEY'S enviable reputation for superior model products. It pays to buy from the leader! Now choose the finest flying kits and save! Pick your favorites and send in your order today!

CURTISS NAVY RACER

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Please write for special discounts on the new popular priced SELLEY line.

CAPTAIN MOLLISON'S **PUSSMOTH**

"The Heart's Content"

Only

75¢

Postage 20c

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Boys, here's a REAL Bargain! Think of it! For only 75c you get a kit of the "Heart's Content." This faithfully reproduced FLYING SCALE Model, with its 18-in. wing span, bright green fuselage and yellow wings is a "beauty." This new **SELLEY** Kit comes complete with all ribs and bulkheads printed on balsawood, special fittings, rubber, cement, colored paper and full-size plan with detailed building instructions. **IT DOES FLY.** Send for it **NOW!**

Send for airplane catalogue. Send 5c for boat catalogue.

SELLEY'S MODEL SUPPLIES AT DEEP-CUT PRICES

Spun Aluminum Cowls

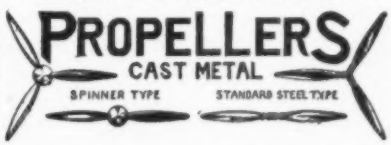
Diameter	Anti-Drag	Open Cowl	Closed Cowl
1⅛"	.20	.20	.20
2"	.25	.25	.25
2⅛"	.28	.30	.30
3"	.30	.35	.35
3⅛"	.40	.45	.45
4"	.50	.55	.55

Cowls can be had in ⅛" graduations up to 6", then in inch up to 10" dia. Packing and Postage, 6c each.

PROPELLERS

CAST METAL

SPINNER TYPE STANDARD STEEL TYPE



2 BLADED		3 BLADED		2 BLADED		3 BLADED	
3¼"	.25			3½"	.20		
4"	.30	4"	.35	4"	.25	4"	.30
4½"	.35	4½"	.45	4½"	.25	4½"	.40
5"	.35	5"	.50	5"	.30	5"	.45
5½"	.40	5½"	.60	6"	.35	6"	.60
6½"	.40	6½"	.70	6½"	.45		
7"	.55	7"	.80	6¾"	.50	7"	.70

Props can be had 8", 9", 10", 11", 12", 15", 18", 21" and 24". Postage 6c each up to 12" dia. Shaft and Bushing 10c extra.

SELLEY MANUFACTURING COMPANY

1373A GATES AVE., BROOKLYN, NEW YORK

Air Ways—Here and There

(*Continued from page 20*)

plane pictures for a number of years. He seems to have the faculty of acquiring prints of all types of airplanes and incidents which other fellows are unable to get. He writes and tells me that he will be very pleased to help out any of the readers in this line. Also, he is the exponent of a photograph exchange club which consists of different fellows who are interested in this subject and who have gotten together by mail to exchange prints, ideas and such things. UNIVERSAL MODEL AIRPLANE NEWS will be glad to print the news of this club in each succeeding issue. So, if you require a picture or are interested in what we have to say concerning Mr. Cord, we suggest that you write to him.

CLUB NEWS

Gordon Zimmerman of the Model Aircraft Engineers' Club of Milwaukee, Wisconsin, hereby makes his report of the latest speed contest:

"On December 30th, 1932, a contest for the determination of the fastest plane in the club was held. The rules were: All planes must be designed to the ¾" scale, designed by their owners, and be rubber powered. A thirty-foot course was laid out. Nineteen planes were entered, all streamlined from stem to stern. Each plane had to take off and land under its own power and fly the full thirty feet. All but three planes were finally eliminated by hair-raising crashes and other misfortunes. The three remaining planes tied for first place by consistently making the markers in four-fifths of a second. The three winners were Herbert Markwiess of 2144 North Palmer Street, Orville Goedon of 2545 North Hubbard Street and Gordon Zimmerman of 3908 North 13th Street, in which order they appear in picture No. 23, from left to right. Each week a contest of some kind is held at the club, for the main purpose of bringing out new designs."

Fullerton Aero Club

The Fullerton Aero Club of Fullerton, Pa., is made up of some very live young men, several of whom I have met personally so I can vouch for this. They have proven to be real aviation boosters. One of the first steps taken in this direction, after forming their club, was to mark their town with suitable arrows and names on the top of a large roof for the benefit of air mail pilots or other aviators that might be passing their way.

This was followed up by several model airplane exhibitions and competitions, to stimulate interest among the would-be model builders in the vicinity. They succeeded in having twenty entrants. Not so bad for a start. This was over four years ago. Last September the ability of the young men had progressed to such an extent that two of them entered planes in the national competition at Atlantic City, making a very creditable showing. This club believes in educating its members in fundamentals of aeronautics and has sponsored trips to Lakehurst, New Jersey, for the purpose of inspecting the pride of the Navy, the Akron. A second trip was to the U. S. Naval Aircraft factory at Philadelphia. Now we are waiting patiently to hear what new stunt they have been "pulling off."

Here is a new trick that is worthy of

(*Continued on page 43*)

Airplane Maneuver Contest

(*Continued from page 15*)

The Winner for February

By the time you have read all of the preceding explanation, you will probably be on "pins and needles" and anxious to know if you have won the cover picture for February.

We take the greatest pleasure in announcing that the February winner is Mr. Albert Richard Cline, Third Avenue, Derry, Pa. Congratulations on your very accurate, neat and comprehensive explanation and discussion of this maneuver.

The runners-up—those that placed well up toward the front—are as follows:

Alfred J. Clark, Manchester, N. H.
Norman Kasiner, Rochester, New York
E. Ronald Schuver, Minneapolis, Minn.
John George, New York City
Arthur Shull, Sylvania, Ohio
Paul B. Streich, Flint, Michigan
Frederick L. Costa, Hanford, Calif.
Don Alexander, Hyde Park, Cincinnati, Ohio
Claude Y. Lundquist, Kanab, Utah
Junior Enlow, Mansfield, Ohio
Robert D. Gilson, Pittsburgh, Pa.
Peter Weik, New York City
Jean S. Chadwick, Syracuse, New York
Frank S. McDonald, Hardin, Illinois
Merle Larson, Bridgewater, S. D.
R. J. Frederick, Elkhart, Indiana
Harold Bird, Passaic, N. J.
George Reynolds, Newton, Iowa
Douglas B. Collins, Upper Darby, Pa.

Answer to March Cover Picture

A lonely pilot winged his way several thousand feet above the barren, shell-torn battlefront in Flanders, his keen, roving eye searching every nook and corner of the landscape for a lurking Fokker or Albatross. Suddenly, without warning, his gaze was arrested by a tiny speck that was disgorged by a harmless looking fleecy cloud. Careful scrutiny disclosed it to be a German on patrol, and—coming his way.

The only safe procedure in cases like these is decisive, aggressive action, so down went the nose of the little Spad. Down, down, down it went, the wires shrieking their joy of combat. The unsuspecting German was taken unawares by the sudden stream of bullets that riddled his ship, but a quick maneuver snatched him from death as the Spad whistled down behind his tail.

He was about to congratulate himself, when he realized in horror that he was not out of his scrape, for with the speed of lightning, the Allied pilot pulled back the stick sharply after finding himself below his antagonist. The little Spad responded. Up came the nose, up, up, up, until she was mounting skyward again, nearly as fast as she dropped towards mother earth a moment before. Before the bewildered German could take action, the *zooming* plane was under his tail. One burst from the Spad's guns and it was all over.

Of course, you readers know the answer to our March cover by the time you have reached this point in our story. As our little story illustrates, the ZOOM was used with great success in aerial combat during the war. There are also other uses, as our cover picture for March illustrates.

In Fig. No. 1, you will see two ways a zoom may be executed: (a), from a level

flight; (b), by pulling out of a dive. Speed is required in both cases.

In case (a), the pilot has landed in a small field, too small from which to make a normal take-off, due to the row of trees on its windward side, over which the plane must be flown. If the plane is put in its normal take-off climb, it will hit the trees on the take-off and crash, at about 50 m.p.h. Now, if the plane is flown level almost to the trees to gain its full speed of 100 m.p.h., it can then be flown over the trees in a steep zoom, for at 100 m.p.h., the lift of the wings is *several* times as great as at 50 m.p.h. The reason 100 m.p.h. can be gained by flying level is that the plane has *much* less air resistance when it is in level flight than in normal climbing attitude from a take-off.

In case (b), the pilot gains speed for the ultimate ZOOM by diving. Fig. No. 2 will show you the positions of the control stick and elevators in the zoom maneuver. When the plane has gained full speed, pull the stick back, putting it in an abnormally steep climb, then neutralize the stick so the ship will not loop. When the controls begin to be a little sloppy or "soft," shove the stick forward to recover the level flight position. If you wait until the controls are very "soft," flying speed will be lost and a tail-spin crash will result. Zooming over obstructions is not considered safe flying.

The importance of the zoom to the combat pilot has been illustrated. Fig. No. 3 shows a pursuit pilot shooting a bomber through the floor of its fuselage by means of a zoom approach in comparative safety, as the old-style bomber had no guns which he could turn on an enemy in this position.

Foreign Model Plane Activities

(*Continued from page* 21)

portation and it is with a view to creating airmindedness in our rising generation that the Model Flying Club of Australia has been formed.

The Model Flying Club of Australia is free to all boys and girls interested in flying. There is no charge whatsoever. His Excellency, the Governor and Sir Keith Smith are keen patrons of the club. Its president is Sir Charles Kingsford Smith. A branch of the club is in practically every district and branch meetings are conducted with the thoroughness of a directors' meeting.

Flying competitions are to be witnessed in most of the public parks on Saturdays and Sundays. Here beginners are helped over the first steps and more experienced lads improve their previous flights. Mr. Freshman states that when such a state of mind is found in the coming generation, the work of Lawrence Hargrave, Kingsford Smith, Bert Hinkler, will not have been in vain. The successful future of aeronautical Australia lies with the youngsters.

If you drop a line to the general secretary, the Model Flying Club of Australia, 375 Kent Street, Sydney, membership cards and full particulars will be mailed by return post.

Machine Guns for Your Scale Model

(Continued from page 34)

wood 5/8" in diameter, instead of a pencil, for forming the cooling casing, and make each dimension double that given in this article. With the larger models, more detail, such as cardboard ejector troughs, small ammo belts of black tire tape cut in thin strips, brass escutcheon pins for bolt-heads, *louvres* in the casing, hollow muzzles made of soda straws, and any number of small refinements may be added. Let the size of the gun determine the amount of detail, and remember to use feather-light materials always. Whenever you can make a part, such as breech block, hollow, do so. Keep everything light and only your own skill need limit you in the amount of detail you can include. The writer has put in all the detail that he feels advisable on this job as described, for much more on this size would require a jeweller's tools and unending patience. For the snappy appearance that they give a ship, you'll never mind the few grains of weight they add. As a matter of fact, they add the weight in just about the right place—forward of the center of lift.

A Miniature F.9 C.2 Fighter

(Continued from page 28)

the other surfaces, except the ailerons, which are covered with fabric, the framework construction being the same as the others.

Wings

THE wings, which are the most important parts, must be given special care in their construction, for if a wing is warped out of scale or poorly constructed, it will not only spoil the appearance of the model, but will outwardly show carelessness on your part.

First cut down round, tubular spars to proper length, shown on drawing (top view). Use dowels if wood is to be used. For the top wings, use two ¼" front spars and two 3/16" rear spars. For the bottom wings, use two 3/16" front spars and two ⅛" rear spars.

Mark off the spaces for the ribs on each spar, squeeze one end of each spar to allow for the wing tip rod to be connected and then file the ends to almost a point. Next make the ribs of 3/64" sheet metal or 1/32" balsa. Cut one template for all the top wing ribs and one template for all the bottom wing ribs. Trace all the ribs from these two templates and you are sure to get a perfect set.

The holes in the ribs are traced with these templates too, then they are drilled out, one by one. All the ribs on the top wing are ½" apart except the two end ones, which are ⅜" apart. All ribs on the bottom wing are ½" apart.

Take the spars and slip all the ribs on except the few end ribs which taper down. These must be made the size of all the others first, the holes drilled at the same time as the others and then filed down to the exact length and shape.

When the ribs have been placed in their proper positions, solder them in firmly or cement them if they are balsa. Then solder or bind with thread if wood construction, a 1/32" rod on the trailing edge, extending it around the tip of the wing. Slip a ⅛" tube through the leading edge of the ribs and solder on, or cement. Now bend a piece of sheet metal (.007) gauge, over the leading edge and solder that on to each rib. Balsa if wood construction.

Fasten in all the compression struts, as shown in top view, along with the truss wires, compression members being 5/32" tubing and truss bracings 3/64" tubing or rod.

Place the pulleys for the aileron control wires between the last compression strut toward the end of the wing and the following rib, as shown in top view drawing.

Solder the plates holding the pulleys onto the rib and compression strut, making sure that the pulleys set in parallel to each other, for if they are not, the wires may cross or slip off the pulleys.

Now make the aileron hinges and place them on, as shown in view of top wing rib. These hinges are 1¾" apart and the holes on them and the corresponding hinges on ailerons must be in perfect alignment for the aileron to move freely.

Make four hinges for the wing stubs which hold the top wings onto the fuselage. Place the two front fittings 2 9/16" from bulkhead No. 1 and the trailing spar hinge 2 1/16" behind the front one.

CUT four pieces of (.007) sheet metal the shape of the wing stub, two for the top and two for the bottom of the top wings. Then solder the sheets over the four hinges. Run the aileron control wires through into the fuselage, between the two wing stub fittings and around the upper pulley on each half of the top wing. Then connect it to the "stick" and tie the aileron end of the wire to one of the ribs until you start covering the wings.

Now run the aileron "bus cable" around one lower pulley, through the same hole in the fuselage and around the other bottom pulley. Fasten both ends to ribs temporarily.

Make the wing strut fittings of 1/16" sheet metal and solder them on to both wing spars 4⅜" from the end of the top wing. The holes connecting to the struts on the front fittings must be ⅝" from the leading edge of the top wing and the rear fitting holes must be 1 7/16" from the trailing edge of the wing. Make the bottom wings similar to the upper ones.

The fittings for the struts must be 3¼" from the wing tips and the holes connecting the struts to fittings must be 7/16" for the front ones and 1 3/16" for the rear ones.

Solder four "V" shaped pieces of flat metal onto the spars at the same place as the strut fittings, but let them droop downward on an angle to accommodate the bracing wires (these are for the top wing). The bottom wing has a set of two, one on each front spar.

Make the headrest. The dotted lines on side view of drawings show the shape of the headrest bulkheads. When these bulkheads are made and soldered into place, or cemented, as the case may be, bend (.006) gauge sheet metal around them and solder this to top of fuselage.

Solder or cement the fin onto the fuselage (3°) off center, as shown in top view, and also onto the headrest. Do the same with the stabilizer and point the leading edge of it (3°) downward, as shown in side view.

Now rub the entire surface of all parts

with steel wool to clean off the dirt which accumulates. When you have a high polish on the metal, fit the dirigible hook-on gear. The center of the hook must be in direct line with the rear spar of the top wing.

Next make the propeller. Any metal can be used in making it—brass, aluminum, duralumin, steel, etc.

Turn down a piece of stock to 13/32", the largest outside diameter of the hub. Next drill out a 3/16" hole through the end, the entire length of the hub (1"), and after the flanges have been turned on both ends to hold in the clamps, polish it and cut it off.

NOW, the blades. Make a template the shape of half the blade, and turn the stock down to the shape of template, every so often applying the template to get the correct curve of blade. When that is done, polish the metal and cut it off. Grind these down on a wheel to the shape of an airfoil and file it off smoothly. Polish it and you have the perfect blade.

Drill a 7/32" hole through the hub for the shaft, insert a shaft that size and then a 9/64" tube inside of the 7/32" tube, make it the proper length and solder it in place. Insert the finished blades into the hub, put the clamps on and the propeller is completed, except for the chromium plating.

Nose Cowl

We can now make the nose cowl with the shutters on it. Hammer out a piece of round (.006) gauge sheet metal on a piece of balsa wood, with a round-ended hammer, and it will take the shape of the engine cowl. Then make another but slightly smaller pan, the size and shape of the first, to act as the inside shutters. When this is done, cut out the holes in both of them. Remember, each hole must be in line with the other. When clamped together, they are to be drilled the size of the propeller shaft in the center.

Townend Ring

This can be twined easily enough, but one of correct size can be bought at several model airplane companies.

The Engine

The engine is next. The crankcase can be cast of metal or made from a piece of hard wood. There is a full-size template on the drawings for that. If made from wood, trace the outlines on the block and cut to the proper shape. Sand down smoothly and drill the holes in all nine angles to allow for the cylinders to slip in. Then turn out the inside on the lathe.

If the crankcase is made of metal, cast the piece and perform the same operations as in the former.

The cylinders can be turned on a lathe, built up of washers, or cast. No matter which way they are made, you must use a model for cast cylinders, or a template for spun cylinders. The heads can be carved or cast, depending on the material used.

When these are assembled, place the push-rods in front of each cylinder, solder or glue in place, insert the spark plugs, as shown in plans.

We now proceed to assemble the various units. Set up the wings and struts in their places and assemble the motor onto the fuselage. Connect the controls and make

A TIP-OFF ON THE MAY ISSUE!

The May issue of UNIVERSAL MODEL AIRPLANE NEWS . . . . on all newsstands May 1st . . . . will prove quite interesting to model airplane builders. We have with us again your old friends, *Howard McEntee*, *Stockton Ferris* and *Charlie Grant*, who lend their talents to model aviation.

Gordon Light, builder of the ship that won the Wakefield Trophy in 1932 with a flight of 25 min., 53 sec., tells you how he built this ship.

Robert Anderson has plans and information on how to build the Fokker F-10 A.

The true story of Captain Swaab's experiences in the World War is continued by *Orville H. Kneen*.

If you are a contestant in our Maneuver Contest, we are certain that the May cover will test your aviation knowledge. If you have not as yet tested your skill in judging the plane maneuver appearing on the cover of UNIVERSAL MODEL AIRPLANE NEWS, then begin with the May issue. You have a chance to win the monthly prize . . . . the original cover drawing . . . . a prize any boy would be proud to own.

sure that everything is in working order before taking the model apart.

WHEN everything is lined up and the controls are working smoothly, take the entire ship apart, with the exception of the soldered-on parts, painting the wing ribs, spars, etc., with aluminum dope-paint.

Cover the wings with "Chinese silk" and do it very carefully, for it is on the covering that most fellows slip up. A poor covering will always spoil the appearance of the model and, no matter how good a paint job you can make, the model will always look sloppy.

When covered, you can either brush or spray the clear dope and paint on. First, give the wings about six coats of dope, sanding the surface between each coat. Then mix some clear lacquer with the lacquer paint. If you have or can borrow a spray gun, I would advise you to use it. as it will enable you to do a finer job. If you use a brush, buy Rogers brushing lacquer or enamel.

Paint all parts, such as landing gear, cowling, engine, and all other removable parts, including wings, separate from the fuselage.

Use the following colors: Army "chrome yellow" for top of top wing and top of stabilizer and elevators. Aluminum paint for bottom of top wing and both sides of bottom wing, both sides of fin, underneath elevators, stabilizers and both sides of rudder.

The fuselage is all aluminum. There is a red band around the fuselage (⅜" wide) directly behind cockpit. The wheel pants, belly tank and Townend ring are also red. White stars in a blue field, with a red dot in center of star, are placed toward the end of the wings (top and bottom). The stars on top wing do not touch the ailerons. They are set toward the leading edge of the wing. The rudder contains three bars; the outer bar is red, the center one white, and the inner one ultramarine blue.

For any further information, write Joseph Battaglia, c/o Editor, UNIVERSAL MODEL AIRPLANE NEWS, 125 West 45th Street, New York City.

Fighting Wings Part II

(Continued from page 7)

was. A whole flock of German Fokkers. The party was on. They formed a circle and I was "It" for a game of ring-around-a-rosy. Each German in turn would fall out of the circle, dive at me with a few hot bursts, then coast up into the ring again.

Only one thing about this game looked good to me—they missed me. I decided to try a little aerial gunnery myself, when one of the Boche lads made a serious mistake. He flew directly into my line of fire. I opened one gun—the one that hadn't jammed. He resigned from the moving picture almost at the same instant—out of control. But nine more were still playing the game and an accident might happen any moment.

I wiped my flying suit and yanked off my helmet which was soaking wet inside. I wiped my forehead several times. The game went on. My eyes began to cloud over and wiping my forehead again I saw that my hand was red—tasted it.

Blood! And undoubtedly my own. I felt my scalp and started as steep a climb as my Spad would take. I traced three distinct creases in a scalp that hadn't a hole in it when I took off—a few weeks before, so it seemed.

THE game annoyed me now. A gauge in front of me said loudly "Gas running out!" The blood dribbled down over my eyebrows and I thought how nice it would be to drop in on the boys "at home." The party was off, as far as I was concerned, so I made for a nice fat cloud, and through my mind ran an old saying: "Go west, young man, go west . . . ."

I was getting rather mad at myself. I had gotten lost. Then I had forgotten all about allowing for drift. I had tried to land on an enemy airdrome—blind. I had run into a whole squadron. I had deflected several bullets. Now I was going HOME. And if any blankety-blank German got in my way, it would be just too bad for him.

About which time one lad did that very thing. I opened my gun, savagely. It was the right gun. The unlucky devil went down, out of the picture, the war, and life itself. That much was clear, though I got only a few glances at his flaming, smoking spin to earth. I tried a burst at the hawks still trailing me and then my second gun jammed. What a life!

A cool, clammy cloud looked exceedingly inviting. I was not only hot, I was more scared than I had ever been in my life. Still in Germany, a squad of fast Germans on my tail, both guns jammed beyond repair—and my gas running low! I was glad to dash into that cloud.

Then something else happened. That's the way with a war. Everything goes wrong all at once. The cool fleece slapped me first on one cheek, then on the other. My head began to get dizzy. All at once I tumbled—I was falling, my machine out of control! That often happens in cloud-flying. I had gotten into a tailspin. It was like the worst nightmare I had ever had—and then some. Down, down, down I dropped—and then I fell out of the cloud's bottom.

Such ground as I could glimpse on the fly seemed to be jumping up at me. And it wasn't two thousand feet below. I preferred more air than that, to recover from a tail-spin. Lots more. But when some archies began potshotting at me and flaming onions with green fingers reached out for my plane, I just naturally flattened out and headed into the sun once more.

My head got dizzier, my ears started roaring—and that is absolutely all I remember of that party!

LATER I pieced the story together—a whole lot better than they could piece my little Spad into one plane. Whoever it was flying my plane, had flown on for some time headed for home, making allowance for drift; picking out a clearing on a hillside, circled for a landing, and came down with proper heading for an uphill landing. Whoever it was, he did a good job. At least, he got down.

When I came to, I was on my back with my Spad on top of me. Some strange chattering finally resolved itself into French words, for which I heaved a sigh of relief. The Frenchman discussed my landing in detail, wondered how dead the pilot was, felt very badly about the whole business—

but didn't seem to think about *doing* anything.

I wasn't feeling so good. I was practically standing on my head. I wriggled a bit and waved my hand. Nothing happened again. I tried to put in some French words apropos of the occasion. No words came—I gurgled—put up my hand and found I had bitten clear through my lower lip. This war was not so hot.

The Frenchmen argued. "Oh, he's not dead," one said. The others agreed. Finally I felt myself lifted. It was the plane being jerked bodily upward. I had just strength left to unhook my belt and then I fell out. I dragged myself a few inches out of the way and the world went black again.

Some American cuss-words brought me to. I was packed off to a camp near-by and learned that my rescuers, while the French debated, had seen me diving steeply for a rough landing. Though half a mile away, they had run all the way, annexed a ladder en route, grabbed the plane and got me out—while the French debate was still going on. Hurray for American hustle!

The only thing I didn't like about the business was when the Captain who dressed my scalp, etc., Captain Haggard of the Medical Reserve Corps, asked me if I cared to eat. I said I did, and then, when I had two fried eggs and a piece of good American pie before me, with a mighty hollow interior, my swollen lip wouldn't let me eat! Everything that Sherman said about war was right—absolutely.

A car was sent for me next day, and a stretcher. But I told them to put it up; the only time they'd get me on a stretcher was when I was dead. I hobbled out and we wound around through the green Vosges mountains. We went past my ruined Spad and I got out to take a look.

She—all ships are she—still lay on her back in the ditch. The wheels had caught in the ditch and flipped her over. She was damaged, but not a single bullet-hole could we find!

I NEVER could explain that landing, any more than I could explain why that saying kept revolving in my mind (when the wrong direction meant almost certain death or capture): "Go west, young man, go west . . . ."

The Spad went back to my 'drome and was repaired, no doubt, for a training plane. I went on to the hospital at Garardmer, where Americans had a floor. I got a fine reception and for days had a great time with French surgeons, American ditto, a lot of hospital attachés and—oh yes—pretty French nurses.

The boys from "home" burst in soon after my landing at this soft "'drome," along with my Commanding Officer. My first question was about the rest of my patrol.

"Landed all over France," said my C.O. "Nobody hurt or captured. And what happened to you?"

I stalled them off as best I could, but finally the C.O. got the facts he needed for his official report—that I had gotten lost, had "attacked" a big German airdrome all by myself, had shot down my first opponent, been in a running fight with ten more, sent down two more (not counting a fourth I'm sure of) and got down behind our own lines, with a little creasing in the head as

(Continued on page 44)

"Whats" and "What Nots" of Model Plane Building

(Continued from page 33)

to decorate very lightweight models, India ink may be used, as it covers well, adds almost no weight and comes in a large variety of colors. It may be applied with a brush just the same as the paint.

Numerals, especially the large ones on wings, may be made in several ways. The easiest is to cut them from black or other color model tissue and fasten in place with banana oil, but a more permanent and better looking job results from using paint. First lay out the numerals in soft pencil on the wing. The best way is to cut them to proper shape from writing paper, then trace the outline with pencil. Next, go over the pencil lines with India ink, using a small flexible ruler and a great deal of care. Curved letters such as 5 and 6 are naturally harder to do than 4 and 7, so unless you are making some particular ship, choose the straight line letters only. Then fill in the ink lines with black lacquer using a small camel's hair brush. The ink lines serve not only as a guide for the paint, but they also are the edging for the letters, making a perfectly smooth outline for the paint, and producing letters which look as well as a sign painter could make.

ON models up to two-foot spread or so, the letters and numerals on the rudder are too small for the above method, so they should be carefully put on, using the paint alone. On larger models the ink method can usually be used.

Long, narrow lines such as one sometimes uses along the sides of the fuselage for decoration purposes can be easily made, using the same method, that is, drawing ink lines first, then filling in between them with paint. Although this scheme can be used for any color, black is most satisfactory since the black india ink covers much better than the other colors. For other colored stripes, such as yellow, another method is used. This consists of cutting the stripes from white paper with a razor blade and straight edge, the paper having been previously painted the desired color. The paper must not be very heavy as this will make the stripes appear to stick out, but at the same time, tissue paper cannot be used, for it is too flimsy. Choose plain white pad paper of smooth finish. If the stripe should have any curves in it, it may be easily cut with sharp scissors from the colored paper. Model cement is used to stick the stripes to the ship and great care must be taken, for too much cement will cause some to ooze out and smear the covering, while too little will not hold the stripe satisfactorily, allowing it to come loose or curl slightly. Banana oil is not strong enough to use for this purpose.

Scallops on wings or fuselage are hard to make for some, but a method has been worked out which is easy and gives wellnigh perfect results. This is shown in Fig. 3. A ruler is placed along the wing at the desired distance from the leading edge. Set a compass at the width desired for the scallops and make a semicircle on the covering as shown. Then continue making them, matching the end of one with the beginning of the next. Set the point of the compass on the ruler, not in the paper, and, of course, use India ink with it. Pay no attention to the markings on the ruler, but just match the ends of the semicircles. Then fill in with paint. In all these cases where India ink is to be followed with paint, the ink lines must be fairly wide so that a little leeway is allowed for the paint to spread. Do not make them too wide, however, as the ink is apt to smear.

Wheels are usually finished with a black rim to represent the tire, while the center disc part is either silver or some color, often following the fuselage color. The easiest way to paint the wheels is to put a pin through the center and with a bead underneath stick the wheel to a board. Then by turning the wheel and holding the wet paint brush against it, a smooth circle results. When dry it may be turned over and the process repeated.

Cowl rings are either of celluloid or wood. The latter may be turned from a balsa block or cut cross grain from balsa sheet and bent in a circle while wet. Incidentally, sections cut from ping pong balls make fine cowl rings for small models. They are very light and almost unbreakable. When fastening on use as little glue as possible, as it tends to soften and dissolve the celluloid.

The process of finishing balsa wood parts consists of rubbing plain white paste on the part to be finished. When it dries it is sanded with very fine paper, after which the paint or other finish is applied.

These suggestions finish the subject of decoration of models. As far as outward appearance goes, the decoration can make or break a model.

Air Ways—Here and There

(Continued from page 36)

mention. George W. Diefenderfer, one of the club members, has recently built a wind buggy which is shown in picture No. 24. He used an old Model T Ford engine to drive the propeller. The body he built out of his own head and he had enough wood left to make another. The body is on the order of an airplane fuselage covered with muslin and doped several times. He has promised to send us news of the speed trials, which we will look forward to with great anticipation. Next month we will have a few pictures of models to show you, which have been built by the members. Lack of space prevents us from printing them in this issue.

Bamberger Aero Club

The Bamberger Aero Club of L. Bamberger & Company, Newark, N. J., under the guidance of Mr. Irvin Polk, is progressing with leaps and bounds. Some of our readers may not be familiar with the fact that this club is the oldest club in existence at the present time. In fact, way back in 1911, when I was one of the members of the old Aero Science Club of New York and Elizabeth, N. J., Aero Club, I flew models in competition with members of the Bamberger Aero Club. Today, among the members of this club are some of the most expert model builders in the world.

In order for a member to advance, in this club, he must pass the requirements designated for each rank. Upon completion of all requirements for any rank, a member receives a bar which is to be attached to his pin. Any member advancing from student flyer to private pilot or private pilot to ace, must return his old bar before the advanced grade bar will be presented to him. The requirements for the various ranks are as follows:

Student Flyer

(a) Must have built and flown a model glider not less than 5 seconds.
(b) Must have built and flown a Baby R.O.G. model not less than 15 seconds.
(c) Must define five aeronautical terms.

Private Pilot

(a) Fly an indoor tractor not less than 30 seconds.
(b) Build a fuselage type model to fly indoors not less than 25 seconds, or outdoors not less than 30 seconds, or 200 feet; or build a flying scale model that will fly at least 10 seconds.
(c) Define 15 aeronautical terms.

Ace

(a) An indoor flight with any type model of not less than 3 minutes.
(b) A flight with a twin pusher, "A" frame model of not less than 1 minute.
(c) Construct a true scale model.
(d) Define 25 aeronautical terms.

Any member who has attained the rank of Ace, may organize a new squadron of not less than ten members. By serving as its leader, he will receive a bar and the rank of Squadron Leader.

At the weekly meetings of this club, many interesting speakers have been present to enlighten the boys on various phases of aviation. Lieutenant Colonel George Vaughn, America's second ranking living Ace; George D. Ream, Department of Commerce Inspector for New York City, and Northern New Jersey, and George Viehman, transport pilot and instructor at Hancock School of Aviation, were some of the speakers during February.

Some of the boys are becoming interested in gliders and Henry Orzechowski who holds a Private Glider Pilot's license, has formed a glider squadron. They are contemplating building an eight-foot soaring glider.

Haaren High School Aviation Annex

HAAREN HIGH SCHOOL, one of the first public schools in the country to recognize aviation and include it in its course of study, now has a registration of 1433 students in that field and an experienced faculty of 51.

It offers a number of aeronautical subjects in conjunction with the regular academic courses found in any high school. These prepare students for ground work in aviation. It covers the theory of flight, airplane construction, design and maintenance, engine repair, rigging and related metal work.

The Aviation Annex is equipped with airplane rigging, engine, wood-working, electrical and sheet-metal shops. It has a number of airplanes and engines with a large assortment of parts contributed by the Army, Navy and representative commercial aircraft corporations. A fully equipped wind tunnel for experimental purposes is also available.

On alternate weeks, coöperative work is carried on at Floyd Bennett field, New York City Airport (Flushing), Glen Curtiss (North Beach), and Tetorboro Airport, all in the metropolitan area.

Sprinkled throughout the aeronautical faculty list are names of men whose services as pilots and engineers, either in the Army, Navy, commercial aviation or in private life, stamp them as the ones best suited to pass on information to the pilots, mechanics and engineers of the future.

National Aviation Reserve, Queens Unit

The Queens Unit of the National Aviation Reserve, located at 92-35 Union Hall Street, Jamaica, New York, is reconstructing an OX Challenger Biplane, which has a seating capacity for three persons.

Three years ago the National Aviation Reserve Association was organized by Henry H. Fisher, Henry Haarmeyer and Lee Hurdman Harris, veteran pilot and aeronautical advisor, for the promotion and advancement of aviation, and to teach young men who are air-minded, the theory of flight. The unit is divided into two groups; junior members, twelve to fifteen years of age, are taught model building, with the assistance of "Sonny" Wiegel and Walter Proctor; senior members, fifteen years and older are taught the theory of flight and practical airplane construction by Charles Wronwick.

Weekly meetings are conducted by the club every Friday evening. The organization is contemplating establishing units throughout the United States.

Tune Up Your Air Buggies

On September 9th and 10th, 1933, the Indianapolis Municipal Airport in conjunction with Indianapolis organizations, will hold a combination of aerial demonstrations and air races. These events will be known

(Continued on page 47)

Fighting Wings Part II

(Continued from page 41)

my only casualty, not counting my bruised left arm and right leg, or my bit lip, which had to have a few stitches.

I later found out why my throat seemed to burn like a prairie-fire—a bullet had scorched by, just missing the jugular vein by the thickness of a piece of tissue paper. I ached and burned for a few days, but I had such a good time with the nurses and everybody that I rather hated to leave, ten days later. There was a great reception at camp and I soon heard about the other boys. Our Commanding Officer, up alone the day the St. Mihiel parade began, had overhauled a Hannoveraner streaking it for home, and put the quietus on him.

Then, when he started for another German, a bullet from the ground conked his motor. He landed on territory that was in the enemy's hands a few hours before. Luck!

Some of our comrades were lost after good fights. The Germans were putting more planes against the American front. I felt okay, and being made Deputy Flight Commander about this time, I figured on getting back to work, where I was needed.

On September 14th, three groups of the enemy attacked one of our patrols. Arthur Kimber had his plane shot to pieces under him—and got down with a whole skin! Ray Brooks fought his way out against eight or ten and added another to his four victories. He found twenty-two bullet holes in his machine, and his right rudder control was shot away.

RAY and I were sent away for a couple of days' recreation. Then we insisted on getting back. We moved camp to keep up with our forces pushing ahead in the Meuse-Argonne. We drove past miles of trenches, barbed wire, shell holes and wreckage of all kinds. Our boys were mopping up the Front—and the way it rained all day, mops were the thing.

I picked out fine quarters in the home of the village mayor. I could find it on the darkest night, by the manure pile in front, biggest in town. Cow, chickens, the family horse and children were all conveniently located under my window or feet, and "perfume" was everywhere. Likewise mud. The war was not so pleasant for us as back at Toul, where we had our clean quarters, showers and recreation.

When the Argonne drive began, with four thousand guns in a "salute to the Kaiser," I was still only able to hobble about and watch our planes take off. There were several fights. Kimber was lost in one of them. Jimmy Beane got a Fokker just after it had shot down a Spad from another squadron. Jimmy was attacked by two Germans, got away, and came home to roost.

My help was needed and I decided to become a "shooting star" again. I got up with the dawn patrol, headed into low, wet, clammy mists—and my motor decided to call it a day. I landed so close to the Front that if it had been ten minutes later I would have finished the war in Germany—or a warmer place.

No Germans were about when I went up again that afternoon. We saw only the usual burning towns and houses, land speckled with shell holes, wrecked villages, flashes from big guns and troops crawling along the roads.

Next morning, though my head, throat, left arm and right leg were still bandaged, as well as my back, I climbed into the cockpit after an argument as to whether I was fit to fight. And I was needed!

Our patrol met three Rumplers under low clouds, some fifteen miles north of Verdun. Circling over these bombers, we caught sight of enemy *Chasse* planes, some miles away, ready to dive upon us. A few seconds later we met over Montfaucon. Every man picked his opponent.

I was getting behind a German when I saw another diving for one of my comrades. My first burst since my big battle—and the enemy fell in flames. I got on the tail of the chap dogging my comrade—when a glance showed *two* of the enemy about to ride my own tail!

(To be continued)

The Aerodynamic Design of the Model Plane

(Continued from page 23)

in angle between wing and stabilizer; curve (B) by a more positive stabilizer setting; path (C) by a neutral setting or no difference in angle, and (D) by a stabilizer set at a greater angle than the wing. The condition indicated by path (B) is the most desirable.

Some reader may ask why the stabilizer is set in such a way that it causes any deviation at all from the normal flight path. If we had to consider only this *disturbing effect*, it would be best to have *no* difference in angle, but we must also have a means of recovering the balance of a plane and this difference in angle is a very important factor in this respect, as we will see later. We must compromise. There must be a slight difference in angle, but not too much. As we have said before, about (two degrees) will be sufficient, usually.

The length of the stabilizer moment arm as disturbing factor No. 6, can now be considered. This moment arm is distance (W-S) in Figure No. 62.

It can readily be seen that any pressure on the stabilizer which forces it up or down a given distance, will throw the plane out of normal flight position longitudinally. The shorter the length of the moment arm (W-S), the greater will be the angle of displacement of the plane from the normal position for any given movement of the stabilizer, upward or downward. The longer the moment arm, the less the angle of displacement and the more easily will the plane recover its normal flight poise. Figure No. 62 shows this clearly. Line (A-A′) is the longitudinal axis of the plane with a short moment arm, while (B-B′) is the same axis with a long arm. The movement of the stabilizer downward is the same in both cases, yet the angular displacement (the important factor in this case) is much less in the case of the long moment arm.

THUS we see that the longer this moment arm, the less the plane will be disturbed while in flight.

How long should it be? you ask. Well, experience has shown, as stated in our discussion of *directional stability* when referring to the moment arm of the fin, that the moment arm should be equal approximately to *one-half the wing span*. In any

case, it should never be less than two-fifths the maximum wing span, unless you do not care whether or not the plane is erratic in flight. The shorter it is, the more likely it will be that the machine will stall and dive. The cause for such maneuvers of flying scale models is generally a short stabilizer moment arm, combined with too little stabilizer area. The death of more than one pilot has essentially been due to a tendency of the planes which they were flying to act erratically because of a short stabilizer arm, or, as we say, because they were too "close hauled." The angle of displacement was so great and so sudden in these cases that the pilots had neither time nor distance to recover the balance of the ships before they crashed.

The faster a plane travels, the longer this moment arm should be. Never close haul a speed model, for it will not hold its course readily. A sudden, steep climb or stall at the start of a flight, when the rubber motor has greatest power, is not only due often to too much difference in angle between the wing and stabilizer, but to too short a moment arm. Very slow ships may be flown successfully with short moment arms, in which case they will recover their balance very quickly, due to the short arm. However, it usually is not advisable, as equilibrium is regained at the expense of motive power and the flight is therefore shortened, even though it may be only very slightly shortened.

Remember we are discussing *disturbing factors* of equilibrium, and so far, we have not considered factors that contribute to the stability of a plane. Disturbing and righting factors are not separate and distinct, but interlock, so to speak. Some of our factors cause the plane to be disturbed in flight and also contribute to its recovery. So, in our final decision regarding choices of dimensions and angles, we must understand the whole story. Therefore, do not make any definite decisions at this point in our discussion, for we have yet to take up the factors that contribute to stability.

There is one other factor which has a tendency to throw our plane out of equilibrium, longitudinally, and that is the location of the point of application of power and the direction in which this power acts relative to the various components of the entire machine. This is factor No. 7. It may cause great instability if it is not located properly.

The fundamental questions in this case are: (1) Where shall the line of thrust, Fig. No. 63, be located relative to the point of resistance to forward motion? (2) Where shall power be applied relative to the center of gravity? They should be considered in the light of causing as slight a disturbance to the normal flight of the plane as possible, unless this tendency to turn the model from flight position is counteracted by the action of some other part of the machine. Fig. No. 63 shows the position of the line of thrust relative to the line of resistance and center of gravity of the machine. This arrangement and relative position of these factors is usually the most advisable one. However, other conditions may modify this arrangement in certain cases, so do not consider it as final.

WE may say that as a rule, the best position of the line of thrust is at a point about 1/16 of distance (W-S), Fig. No. 63 (which is the stabilizer moment arm), below the center section of the wing (measured from leading edge). The line of thrust should act in a direction parallel to the longitudinal axis (MN) of the fuselage. In this position it will act to nose the model upward slightly when under full power. This is exactly what is desired. In many cases a negative stabilizer angle is used to do this, which however causes a downward pressure on the tail plane. This pressure acts as a load that the wings must carry and therefore reduces the flight qualities of the plane.

However, when the nosing up effect is derived from this low position of the line of thrust, the stabilizer may be set at 0° or even a slight positive angle of incidence (to the line of thrust).

The line of thrust may be applied at a point which is much lower than this *if the center of gravity is below* the line of thrust under these conditions. This is the governing factor:—*never place the line of thrust* (center line of propeller shaft), *below the center of gravity.* If you do, the plane will have a very steep glide or will even dive sharply at the end of its flight.

On the other hand, never place the line of thrust above the line of resistance (which is approximately at the leading edge of the wing center section, when proper dihedral is used) if it is possible to establish any other arrangement. Of course in the case of low-wing monoplanes, this undesirable condition usually exists. Therefore it is necessary to overcome the diving tendency which is produced at full motor power, by increasing the *negative* angle of incidence of the stabilizer.

(Continued on page 48)

Blaze Air Trails with This Howard "Pete"

(Continued from page 8)

Wings

THERE are four special ribs and a wing tip to make for each panel. The leading edge is cut from ¼" square balsa. This makes it very heavy but it will receive many hard knocks. The ailerons are optional, but are very handy to compensate for the torque or a wing warped in building, as they cannot be warped after the thread bracing is in place. They are made of very thin balsa (1/64" or less) for an upper surface, which is supported by four ribs. The leading edge is a piece the depth of the wing at that point. The bottom of the ailerons are covered with tissue.

The wing roots have rather a complicated shape and should be made with care. The inside edge runs along the chord line of the wing section (the M-6) from the leading edge to the rear spar. When this is cemented so that the edge is on a line with the bottom of the lower longeron, the wing has an incidence of exactly 2°.

The rear spar consists of two pieces of 1/16" square set into notches in the ribs. All of the ribs in the model (including tail) are of 1/32" balsa. (Medium hard.)

Landing Gear

The struts that form the landing gear vees are cut to size and then streamlined. All but the bottom end. They are then glued together and the little fillet put in. When dry the bottom end is streamlined. The top

(Continued on page 46)

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Aviation Advisory Board

(Continued from page 16)

ailerons. However, when the propeller is unwound and the machine is gliding, it will have a tendency to spiral down, turning sharply to the right, if a right-handed propeller is used. This is not desirable. A better way to correct the turning tendency of propeller torque is to build your ship so that the tension on the rubber motor twists the tail surfaces slightly out of line with the wing. The amount of twist in the tail is proportional to the amount of torque on the rubber band and, therefore, torque on the propeller. By building a machine in this manner and adjusting it accurately, a perfectly straight flight may be made from start to finish. In some cases it is necessary that the tail should be twisted by the rubber motor tension at least 10 degrees. The propeller torque may be diminished to a minimum by the use of a propeller with sufficient blade area (10% of the wing area or more).

Question: Is a propeller, having a very thin section—for example, one twisted from a thin sheet of balsa—more efficient practically, due to its lower weight, than a heavier propeller having a cambered blade?

Answer: Practically, the propeller of very thin section is just as efficient, provided it is given sufficient curve or camber. In the question above, where it refers to cambered blade, I am taking this to mean a blade with an airfoil section. All propeller blades should have a certain amount of camber. The more the camber, the slower the propeller may turn and yet deliver the same amount of thrust. Do not use flat blades if you want efficient results.

LATELY, I have looked over a great many models built by young men and there is one fault which is commonly made. Before we close, I feel that I should say a word or two concerning it. In an effort to increase the efficiency of the main wing, many fellows have given very little "dihedral" to it. This has resulted in a tendency, on the part of the model, to spiral nose dive. As space is limited, I will not try to explain the reason and exact phenomena which takes place here, but will give you the exact figures which will cure the trouble.

When the main wings are set on the model so that they are a very short distance above the thrust line (center line of rubber motor) or slightly below the thrust line, the wing tips should be raised 1 inch for every foot of span. This amount of dihedral will insure perfect lateral stability. Possibly, you will be able to use less on your machine. If you can do this successfully, there is no objection to it. However, you may be assured that the value of dihedral given above will satisfy nearly all cases. If your machine should be of the high-wing type, where the wing is set above the line of thrust 1/25 of the span or more, then the wing tips should be raised one-half inch for every foot of wing span in order to give it the proper amount of lateral stability.

If you have any questions which you wish answered, do not hesitate to send them in. We will do our best to answer them to your satisfaction.

With best wishes for good luck until next month.

Blaze Air Trails With This Howard "Pete"

(Continued from page 45)

of each strut has a notch which fits over pieces D and E in the fuselage. This is so that they may be cemented more firmly. The lift bar is of 1/16" and sanded to the same section as the wing. There are two small half-round streamlines at the end of it.

Propellers

The flying propeller for this model is cut from a block 6" x 1" x ½". This prop should give a medium low angle of climb. For greater or less angle the end dimensions of the block can be changed, keeping the ratio of two to one. This scale prop looks well for exhibition purposes.

Assembly

The stabilizer and rudder are already in place. The landing gear vees and bar should be put together and glued on. The wing is covered before being cemented in place. Small squares of paper are removed at the points where special rib No. 4 touches the spars. These are so the wiring may be put in. The fuselage is now covered. Now take some bottles or other small props and line the ship up into flying position. Put something under each wing tip to give the correct dihedral. Exact scale is 3/8 inch, but better flying can be had using ½ inch. With the wings held in this position, pass the landing threads through the openings in each wing in the places shown in Fig. 1. Use weights to make sure the bracing is taut; then glue in place. When dry, bring thread around the rib again and coat with more cement.

ON this model there are no shock absorbers, so it would do well to use rubber tired or balsa wheels. They would also give a lower center of gravity. If celluloid is used, be sure they have eyelets.

Take piece "A" which is thin aluminum and put one thread through each hole in the top. Very heavy pins (about 1½" long) are used for axles. Put one of these through a metal piece, slide on a wheel, bend over about 3/8 inch of the pin on itself, after cutting off ¼ inch. These pins with the wheels are next bound and glued to the bottom of the lift bar. When they have set, the flying threads are put in place in the same way that the landing were.

Decoration

The finish of the ship all depends on how much weight you feel like adding. Being a white plane, you could leave off all dope, merely spraying with water. The original was first water-doped. Two coats of thin lacquer were then brushed on smoothly.

The lettering is all laid out in Fig. 5. The wing licenses, blue with black borders; "37's", solid red; "Pete" and rudder license, black.

Flying

Select a large, smooth place. The model takes about a six-foot run to lift. Use six to eight strands of ⅛ flat.

Suggestions for Lightening

Use smaller sizes of all materials.
Leave out half the ribs.
Leave out stringers.
Use a bent balsa leading edge.
Don't dope the models.

A good reduction should bring the weight down to less than ¾ of an ounce.

Air Ways—Here and There

(Continued from page 43)

as the Indianapolis Municipal Airport Dedication Anniversary Program and will be sanctioned by the National Aeronautical Association.

At present, a certified five-mile triangular course is in existence at the Indianapolis Municipal Airport and before September it is the wish of the management that a three kilometer authentic speed course will be constructed.

A particular invitation is extended to the pilots competing in the National Air Races to attend the Indianapolis show on these dates. Please publish in your calendar of coming events.

IT has been rumored that your most humble editor, Charlie Grant, intends to carry on a summer camp for "aeronuts," during the summer months, in the Green Mountains, Peru, Vermont. Those who attend will concentrate chiefly upon the designing, building and flying of model aircraft. It is also said that Mr. Howard McEntee will be in attendance to show many tricks of model building. Between flights, the boys expect to have considerable pleasure in swimming, hiking and perhaps just lying around, getting some of that good old sunlight and clear mountain air into their lungs.

CORRESPONDENTS

Kenneth Burtness of Oregon, Wisconsin, would like to have readers write to him. He is interested especially in exchanging pictures of models.

Here are also the names of two other fellows who are looking for some new ideas: Merrill Hart of 51 Rush Street and Francis Lawless of 123 Walnut Street, both of Somerville, Mass.

Robert Roedder, Box 178, Devon, Pa., wishes to correspond with foreign model builders. Here's a chance for some of you Australian and New Zealand boys.

Frank Yellen of 130-21 95th Avenue, Richmond Hill, New York, wishes boys to correspond with him and states the following: "I have in my possession about thirty plans for different planes that I have made and would like to exchange these for plans owned by other model builders." This is a good way to get plans of the ships you wish to build without paying for them, provided you have plans that you wish to exchange.

A New Idea in Model Building

Here is another new idea which has been introduced into the model airplane building field. According to its originator, A. S. Blumenthal, an aviation engineer, it positively eliminates all guesswork and enables one to construct a perfect flying scale model in record time.

"Beginners as a rule always meet with one difficulty or another in constructing any kind of scale models and are often so discouraged that they seldom complete the plane. This new idea, which is a combination 'jig' and drawing, gives the model builder (the novice as well as the more experienced), something he never had before. The 'jig drawing' is die cut and when the brackets or 'jigs' of each section are bent up, they form supports for holding the various balsa parts of the model in the proper position for gluing. This system follows the same plan as that carried out in the actual building of aircraft at the factory.

"With this 'jig,' accurate alignment of all parts is assured."

A Glossy Aluminum Finish For Propellers

Kenneth Simpson of 606 Crouse Avenue, Syracuse, New York, contributes some helpful information as follows:

"A piece of balsa to be painted must first be thoroughly sanded with very fine sandpaper. Now make a mixture of half-and-half of clear ambroid and banana oil, which should be generously applied to the piece with a brush. After drying thoroughly the piece is sanded again until it becomes smooth and possesses a dull finish. If this has not covered the pores in the wood, another coat must be added and sanded in the same way.

"The next step is to make a mixture of aluminum paint. This mixture consists of a little aluminum powder, acetone and nitrate dope. About an ounce of dope is thinned out to a freely brushing consistency with acetone, then the powder is added, about half of a ten-cent tube, which may be purchased in a five-and-ten-cent store, is enough.

"The paint mixture is now added to the piece, brushing lightly in one direction only. When dry, sand lightly with the same piece of sandpaper used in the other steps. You may find that the sandpaper is now worn so smoothly that it will not sand, nevertheless, keep on rubbing it lightly across the surface. This should be done with a rotating motion, so it will be sure to rub over the whole surface.

"When the surface becomes glossy and smooth, cease sanding and rub the loose dust off with a soft cloth, being sure to press hard as this also helps in making the surface glossy. As a conclusion I might add that the secret of the correct finish is in the use of the correct grade of sandpaper and the wearing down of it."

Bail Out

(Continued from page 5)

Collins had taken off from Cleveland at 4 o'clock on a cold November morning with 600 pounds of mail and 200 pounds of express, bound for the air mail terminal at Hadley, New Jersey. The weather at his point of departure was clear but as he passed over the town of Mercer it had begun to thicken. He pushed the ship up to 10,000 feet in an effort to climb above the cloud bank, but could not reach the top. The visibility was absolutely nil. It was like being submerged in pea soup.

SUDDENLY the air became extremely rough and turbulent, tossing the big mail plane about as if it had been a scrap of paper. In an instant the ship plunged downward at terrific speed. The instruments showed Collins that he was spinning to the right. He kicked left rudder and pulled the stick back against his stomach, which would have brought the ship out of a normal spin. There was no response. A violent whipping motion set in, jerking Collins back and forth as a mastiff might shake a kitten.

There was no hope for the big flying mail wagon now and Collins prepared to "use the silk." He had no sooner unstrapped his safety belt, than he fell out, indicating that the plane was probably upside down. Tumbling through inky darkness for about 1,500 feet, he finally found the rip cord ring

and opened his chute. A few seconds later he heard the crash of his plane plowing into the ground.

The wind was blowing a gale of forty miles an hour. This would make landing extremely hazardous. Collins was fortunate enough to come down on the leeward side of a hill, however, which protected him somewhat and prevented his being badly dragged.

He immediately started a search for the ship and found the débris scattered over a wide area, one wing three-quarters of a mile from the main wreckage. The mail sacks had been laid open by the force of the impact but the mail was not damaged and was soon on its way once more.

Colonel Charles Lindbergh has had to bail out on four different occasions, which at present is the world's record for emergency jumps.

His first jump was made while he was a cadet at Kelly Field, Texas. Three pursuit ships were simulating an attack on a big DeHavilland observation plane. Flying in V formation, the three came down in a screaming dive on the tail of the DH and then pulled up in a rocket-like zoom. What followed is best told in Lindbergh's own words:

"WHEN we nosed down on the DeHavilland, I attacked from the left," he reported to the War Department. "I continued the dive for a short time before pulling up. I passed above the DH and a moment later felt a slight jolt, followed by a crash. My head was thrown forward against the cowling and my plane seemed to turn around and hang nearly motionless for a moment. I closed the throttle and saw an S.E.5 scout plane, with the pilot in the cockpit, a few feet away. He was apparently unhurt and getting ready to jump.

"Our planes were locked together with the fuselages nearly parallel. My right wing was damaged and had folded back slightly, covering the right-hand corner of my cockpit. Then the planes started milling around and the wires began whistling. The right wing began vibrating and striking my head at the bottom of each oscillation.

"I removed the rubber band on my safety belt, unbuckled it, climbed out past the trailing edge of the damaged wing and with my feet on the right side of the cockpit, which was then in a nearly horizontal position, I jumped backward as far from the machine as possible.

"I had no difficulty in locating the release ring and experienced no sensation of falling. The wreckage was falling nearly straight down and for some time I fell in line with its path. Fearing the wreckage might fall upon me, I did not pull the rip cord until I had dropped several hundred feet and into the clouds. During this time I had made a turn and a half and was falling flat, face downward.

"The parachute worked perfectly, and almost as soon as I pulled the rip cord the risers jerked on my shoulders, the leg straps tightened and the 'chute fully opened. I saw the other pilot above me, for I was now below the clouds, and the wrecked planes passed me about 100 yards to one side. They were spinning to the right and leaving a trail of fragments along the path. I watched them, still locked, until they crashed in the mesquite woods about 2,000 feet below and burst into flames a few seconds later. During the descent I lost my goggles, vest-pocket camera, which was in my hip pocket, and the rip cord and ring of the parachute."

Although the business of jumping to save one's life is usually a serious one, a touch of humor is occasionally injected into it. At Selfridge Field, Michigan, recently, two airplanes collided in midair and immediately became uncontrollable. The pilots bailed out with their silk life preservers, while the planes spun into the ground, burying themselves about ten feet.

Lieut. Joseph Muffat, one of the pilots, landed with his parachute near the scene of the crash. When he walked over to the wreckage an excited crowd had gathered. There was an old farmer who did not know that Lieut. Muffat had descended by parachute. After examining the débris the farmer looked at Muffat and exclaimed, "Well, son, you look pretty good coming out of that wreck; your clothes ain't torn or nothin'!"

Aerodynamic Design of The Model Plane

(Continued from page 45)

We now understand something about the proper location of the line of thrust relative to its vertical displacement. However, where shall we place the point of power application (propeller bearing), considering it in a horizontal plane? Should it be located close to the center of gravity or a long distance out in front of the machine at the end of a long-nosed fuselage? The answer is, place it so it will have the least disturbing effect on the plane's equilibrium. This means, *locate it as close to the center of gravity as possible.* The farther out in front of the (C. G.) it is located, the greater will be the tendency of the machine to stall suddenly after it reaches a certain angle of climb. This is especially so if the center of gravity is *above* the line of thrust (center line of propeller shaft). Thus, build your model with as short a nose as possible, at the same time, having all other factors correct.

WHEN the plane is climbing with nose up, the propeller exerts a part of its thrust upward at the bearing, see Fig. No. 64. Thus, when the propeller is located at a point a considerable distance in front of the (C.G.), it creates a decided stalling tendency with the result that the action of the propeller pulls up the nose sharply. When it is necessary to build your model with a long nose to the fuselage, with the propeller a considerable distance in front of the wing, it is necessary to counteract its disturbing effect by greater positive stabilizing action of other factors. The action of the stabilizer for instance.

It is not possible to build a plane so that there can be no disturbing influences reacting upon it in flight. Therefore, we must provide means of overcoming and correcting such disturbances. In the airplane, there is a constant interaction between disturbing tendencies and corrective forces. In the last installment of these articles, the factors which have a *corrective* effect on the plane longitudinally, were listed. Next month we will consider them and determine how they may be used to endow our planes with absolute longitudinal stability.

Until then, "Happy Landings!"

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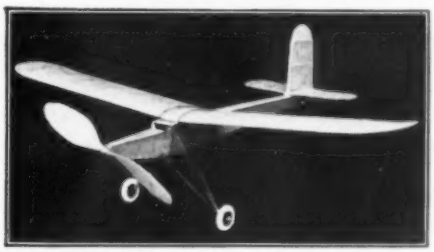

Outdoor Twin Pusher

A twin pusher that has actually flown 12 minutes, not once—but several times. This plane has several features which cannot be found elsewhere. It has a 40-inch "A" frame that is a marvel for lightness and strength, a 36-inch high cambered, tapered wing, and two 12-inch, high pitch props, powered by 68 feet of ⅛ flat rubber. The kit contains complete plans and instructions, stamped ribs, and all other materials needed for the construction of the model. Price..... **75c**

Add 10c for Postage

Outdoor Cabin Tractor

One of the snappiest flying models in its class, proper engineering and all balsa construction does it. This plane has a double surfaced, high lift wing, 30-inch span, all-balsa fuselage, extra strong landing gear to withstand the shocks of outdoor flying, and a large, wide-bladed propeller to keep it up for long endurance flights. The Kit contains complete plans and instructions, stamped ribs, large tube cement, 1 oz. bottle clear dope, pair celluloid wheels, and all materials needed to complete the model. Price **75c**

Add 10c for Postage

3-in-1 Kit Three R.O.G. Stick Models 75c

TWO-IN-ONE KIT

Contains the around-the-world "Winnie Mae" and the "Transatlantic Bellanca." Both 15" wing spans. Kit contains full size plans, bulkheads, large tube of cement and all other materials needed to complete these two wonderful models. Get yours now.

75¢

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NOTE All Balsa shown here in 18" lengths can also be had in 36" lengths, if requested.

Balsa Wood

This balsa is clear, straight grained stock. It is strong, light, and free from defects. If hard or soft wood is desired, specify when ordering.

18" Lengths

1/16	x 1/16	28 for .05
1/16	x 1/8	24 for .05
1/16	x 1/4	24 for .07
1/8	x 1/8	24 for .05
1/8	x 3/16	24 for .09
1/8	x 1/4	24 for .12
3/16	x 3/16	10 for .06
3/16	x 1/4	10 for .07
1/4	x 1/4	10 for .08
1/4	x 3/8	6 for .08
1/4	x 1/2	6 for .09
3/8	x 3/8	6 for .09
3/8	x 1/2	6 for .10
1/2	x 1/2	4 for .10
1	x 1	2 for .16

40" Lengths

1/8 x 3/8	.03
1/8 x 1/2	.03
3/16 x 3/8	.03
3/16 x 1/2	.04

Sheets—18" Lengths

1/32 x 2	4 for .05
1/16 x 2	4 for .06
1/8 x 2	4 for .09
3/16 x 2	2 for .08
1/4 x 2	2 for .09

Plank Balsa

1 x 3 x 36	.25
1 x 6 x 36	.38
2 x 3 x 36	.42
2 x 6 x 36	.75
2 x 5 x 40	.75

Propeller Blocks

½	x ¾	x 5	8 for .06
½	x ¾	x 6	8 for .07
⅝	x 1	x 7	8 for .09
⅝	x 1	x 8	4 for .08
⅝	x 1⅛	x 8	4 for .08
⅝	x 1⅛	x 10	4 for .09
⅝	x 1⅛	x 11	2 for .07
⅞	x 1½	x 11	2 for .08
⅝	x 1¼	x 12	2 for .07
⅞	x 1½	x 12	2 for .09
⅞	x 1½	x 14	2 for .16

Dowels

Straight grained, true size birch dowels — highest quality grade.

1/8 x 18" long..7 for .05
3/16 x 36" long..6 for .05
1/4 x 36" long..4 for .05
For a limited time
12" lengths.....12 for .05

Bamboo

Genuine, straight grained, no-knot TONKIN Bamboo. Strong and light. Splits easily. 1 box.

1/16 x 1/4 x 15".....07
1/32 x 1/4 x 8".....04
1/16 x 1/16 x 9".....03

Japanese Tissue

A fine tissue for covering flying scale models. Strong, light, and takes dope well.

20 x 24.....3 for .05

Veri-Fine Tissue

One of the lightest tissues known. Excellent for endurance models, because of its extremely light weight.

20 x 15.....04

Colored Tissue

Just the thing for the new bright colored ships that are so popular nowadays. Red, Orange, Brown, Blue

20 x 24.....2 for .05

Wood Veneer Paper

Very useful in scale and flying-scale models. Strong, yet light enough to fly.

20 x 30.....13

Celluloid Wheels

Experience has proven these wheels best for flying scale models.

	Pair
3/4" wheels	.05
1" wheels	.07
1 3/8" wheels	.09
1 7/8" wheels	.13

Bushings

for wheels.....4 for .02

Music Wire

Strong, springy wire sold in this new, convenient manner.

1 ft. length—straight
.044, .020, .028, .031
6 feet for .02

Dummy Motors

The very thing for adding that realistic touch to scale and flying scale models. Extremely light. Nine cylinders.

1 1/2" diam. 10
2" diam. 28

Rubber Thread

Careful testing has proven this rubber to be the highest in energy content per unit of weight. This means more turns and less breakage.

.045 sq.....50 ft. for .12
3/32 flat....50 ft. for .15
1/8 flat.....50 ft. for .15
3/16 flat....50 ft. for .16

ALUMINUM ITEMS

Drag Rings

Used on the real ships for cutting down wind resistance. Makes a beautiful addition to any radial motored model.

1 1/2" diam. 15
2" diam. 17
2 1/2" diam. 22
3" diam. 25

N.A.C.A. Cowlings

No dummy motor needed when this cowling is used. Has a hole for thrust bearing in the nose.

1 1/2" diam. 15
2" diam. 17
2 1/4" diam. 23
3" diam. 26

Aluminum Tubing

.010 wall thickness ft.
1/8 O.D. 05
3/16 O.D. 09
1/4 O.D. 11

Aluminum Leaf

Real sheet aluminum, yet almost as light as paper. Makes a beautiful covering job.

.0003 thick
3 1/2" wide...5 ft. for .05

Sheet Aluminum

12" wide
.003, 12c ft.; .005, 12c ft.
.010, 16c ft.

Washers

For indoor, outdoor, and flying scale models.

Large size, 1/4 O.D.
Dozen, 1½c; Per 100, 10c
Small size, 1/8 O.D.
Dozen, 1½c; Per 100, 15c

Clear Cement

The fastest drying, lightest and strongest cement on the market. Try some now. You'll be amazed at its marvelous properties.

1 oz. tubes.....06
2 oz. tubes.....08
4 oz. cans.....20
1 pt. cans.....60
1 gal. 4.50

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Just suited for the model user's requirements.

2 oz. cans.....07
4 oz. cans.....13
1 pt. cans.....35
1 gal. 2.50

Acetone

For thinning out heavier liquids.

2 oz. cans.....07
4 oz. cans.....13
1 pt. cans.....35
1 gal. 2.50

Colored Dope

Highest quality pigmented dope. Do not confuse with inferior grades. Leaves a smooth, even color upon drying.

Blue, Red, Yellow, Orange, Silver, Black, Olive Drab

2 oz. cans.....09
4 oz. cans.....17
1 pt. cans.....60

Thrust Bearings

Light, strong bearings. Hole is truly centered.

Large size .035 hole
Each, .01½; Dozen, .15
Small size .025 hole
Each, .01¼; Dozen, .15

Insignia

U.S. Army and Navy type. Improves the appearance of models by 100%. Each sheet contains 4 stars in circles for the wings, and red, white and blue stripes for both sides of the rudder.

sheet	
1" diam.	.02
1 1/2" diam.	.03
2" diam.	.04
2 1/2" diam.	.05

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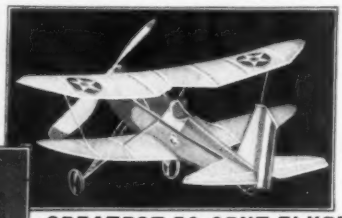

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